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Advertisement Index, see page xl. *Official Notices, see Sup. 42.*

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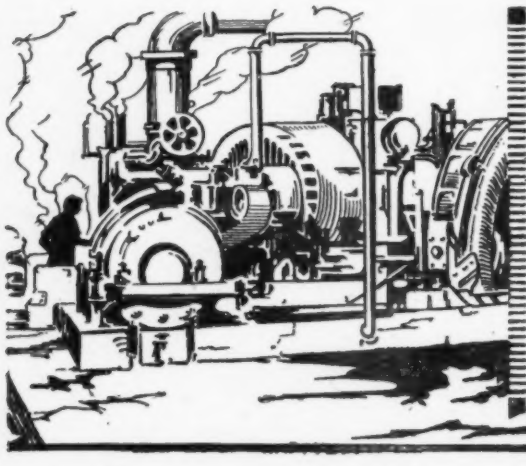

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ELECTRICAL REVIEW.

VOL. XCIII. OCTOBER 26, 1923. No. 2,396.

ELECTRICAL REVIEW.

Vol. XCIII.] CONTENTS: October 26th, 1923. [No. 2,396.

	Page
Diesel-Electric Ship Propulsion	601
The I.E.E. Presidential Address	602
Works Committees	602
Long-Term Contracts with Russia	602
Electrical Showrooms	603
Hydro-electric Works in Sweden...	603
The Society of Technical Engineers	603
Municipal Workers on Strike	603
Trade Prospects in Sakhalin Island, by H. A. Fleet (*illus.*) ...	604
Accidents and Shadows: their Cause and Remedy, by W. E. Bush (*illus.*)	605
The Work of the Electricity Commissioners (*concluded*) ...	606
The Cambridge Remote Indicator (*illus.*)	608
New Electrical Devices, Fittings, and Plant (*illus.*)	609
Promoting Retail Electrical Sales	610
Business Notes	611
The Hackney Electricity Undertaking (*illus.*)	619
The Diesel-Electric Ship "La Playa" (*illus.*)	621
Notes...	624
City Notes	627
Stocks and Shares	629
British Interests in Brazil	631
Trade Fluctuations...	632
The Pavilion, Shepherd's Bush (*illus.*)	633
Technical Staff Councils	634
Legal...	634
The Institution of Electrical Engineers...	635
Correspondence—	
The P.M.G. and Electrical Undertakings	639
Wireless Retailers	639
Electric Cranes	639
Strictly Home Office !	639
New Patents	640
Published Specifications	640
Contractors' Column ... ... Advertisement page xxviii	

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DIESEL-ELECTRIC SHIP PROPULSION.

WHILE she can hardly lay claim to be the first Diesel-electric ship, *La Playa*, an illustrated description of the propelling machinery of which appears elsewhere in this issue, is of very great interest as representing the most important example of the use of this system of propulsion in the mercantile marine. We have frequently dealt with the advantages which follow the use of electrical machinery for the propulsion of merchant ships, but it may be of interest if we emphasise the peculiar advantages which result from the use of Diesel engines for generating the electricity which actuates the propelling motors. Shipowners are rapidly awakening to the immense possibilities of the Diesel engine for the propulsion of cargo vessels of moderate dimensions, say up to 400 ft. in length, although it is recognised that there are certain inherent disadvantages inseparable from the use of these engines on board ship. The quarterly returns recently issued by Lloyd's Register show that of the 304 vessels of more than 100 tons under construction in Great Britain and Ireland, no fewer than 49 are to be propelled by internal-combustion engines, which affords an indication of the progress that is being made in the use of this type of engine on board ship. While, however, such engines are remarkably economical as regards fuel consumption, figures as low as 0.3 to 0.4 lb. of oil per b.h.p.-hour being frequently obtained on trial, the cost of maintenance is often very high, and many instances of breakdown have to be recorded. In most cases, the Diesel engine is directly coupled to the propeller shaft, and the speed of the engine has to be low enough to obtain the best results from the propeller. This means an engine speed of not more than 100 revs. per min.; a speed of between 70 and 80 revs. per min. is preferable, and at these low speeds the engine becomes very heavy in comparison to the power it develops. Again, as it is directly coupled to the propeller, it follows that the whole of the reversing and manœuvring must be done on the main engine, and this is what the low-speed Diesel engine is least fitted to do. A study of the design of various types of marine Diesel engines will show that the reversing gear is often very complicated, and that not only is it a difficult matter to change the speed of the engine quickly from "full ahead" to "full astern," but to obtain intermediate speeds, particularly very low speeds of rotation in either direction, is also very difficult.

The "Diesel-Electric" system has been designed to overcome these difficulties. As will be seen on studying the equipment of *La Playa*, the main Diesel engines can be designed to run at high speed, thus yielding a light and compact unit, while as the engine is always running in the same direction and at its normal speed, all the complicated reversing and manœuvring gear is eliminated. The simplicity of the Camellaird-Fullagar engines on *La Playa* is particularly noticeable. On the other hand, the propelling motor which is directly coupled to the propeller is designed to run at very low speed, so that the maximum propulsive efficiency is obtained. By placing this motor in a separate compartment right aft, the usual shaft tunnel from the engine room through the after hold is eliminated, thus yielding considerable extra cargo space, a matter of importance where a light cargo

like fruit is carried. This advantage is, of course, obtained with all systems of electric propulsion. Particular advantage attaches to the use of four small generating sets in the engine room rather than one large set. It is well known that as the size of the cylinder of the Diesel engine is increased, the difficulties of cooling the various parts exposed to the heat of combustion become very much greater. This is because the cooling surface varies only as the square of the cylinder dimensions, while the volume and therefore the amount of heat developed varies as the cube of these dimensions. By using cylinders of small diameter, efficient cooling of all parts is assured, with corresponding increase in the reliability of the engines. Further, as is the case with every type of engine, with a Diesel engine maximum efficiency is only obtained when the engine is developing its designed load. Hence, when it is desired to run the vessel at reduced speed, one or more of the main engines can be shut down, and the remainder still worked at full power. This is of particular advantage on a fruit-carrying vessel, where it is usual to run at maximum speed when carrying cargo, but to proceed at a reduced and more economical speed when unloaded. In this case *La Playa* will run at her maximum speed of 14 knots, requiring all four main generators to supply sufficient current to the propelling motor when proceeding from the West Indies with a full cargo of fruit, but on the return journey in the light condition she will run at reduced speed, requiring only two or three of the main sets in operation. The added reliability of four generators combined with a double motor as compared with the single engine direct coupled to the propeller shaft is apparent, as also is the value of this where a perishable fruit cargo is concerned. The performance in service of *La Playa* and of her sister vessels, *La Marca* and *La Perla*, will be watched by electrical engineers with the greatest interest.

The I.E.E. Presidential Address.

The Institution of Electrical Engineers this year has made an early start with the new session, and at the first meeting, on Thursday last week, the theatre was filled to the doors to hear the presidential address.

Dr. Russell reviewed the progress of the electrical industry since the Armistice, usefully drawing attention to a number of new departures which when thus brought together afford abundant evidence that there is no standing still in any of the numerous and widely diversified branches of electrical engineering. Interesting reference was made to the tendency towards the adoption of higher and higher pressures in underground cables in this country; the fact that British manufacturers are now making three-core cables for 66,000 volts on a commercial scale is a gratifying testimony to their maintenance of the leading position amongst the cable-makers of the world—but this is not the end, for already 100,000-volt cables are in contemplation. Single-core cables for 66,000 volts between phases present no special difficulties; with polycore cables the matter is different. More will be heard of Major A. M. Taylor's proposals, which enable transmission to be effected at 150,000 volts with cables insulated only for 45,000 volts; his scheme has been the subject of favourable expert comment in the United States. It is interesting to note that the lead-covered, paper-insulated type of cable is being adopted by the British Post Office for submarine telephone communication with Holland.

The mechanism of thunderstorms is a favourite subject of Dr. Russell's, and we have reproduced his remarks on this problem almost *in extenso*. His industry in evolving new mathematical theorems which are of immediate use to electrical engineers is manifest in the appendix to his address; in this respect he stands almost alone.

Works Committees.

We make no apology for returning to this subject of works committees. It is the lost pleiad in our Whitley constellation. Without works committees the Whitley system is incomplete—the machinery of Whitleyism is not brought down to the individual undertaking. We are reminded of this incompleteness of the Whitley Councils in the electricity supply industry by an article by Mr. John Murray, M.P., in *Current Opinion*, the journal of the Industrial League and Council. Mr. Murray is a whole-hogger for Whitleyism; in fact, he advocates Whitleyism being embodied in law. And the feature with which he is most impressed in Whitleyism is just the feature that is left out in the electricity supply industry—works committees. He visualises in works committees a possibility of educating the workers in industrial economics. Mr. Murray wants the worker to have some real knowledge about his industry—a knowledge that is much wider than that contained in his narrow round of duties. The worker must know much more than he now knows about the employer's side of the business—about the employer's function as employer, his problems, his burdens, his difficulties. And the way the worker can most adequately acquire this knowledge is by sitting down with his employer in works committee. In Mr. Murray's phrase these committees "build a house of opportunity." He has full faith that once employer and employed are brought together in Whitley works committees as a permanent institution, the present sordid bickerings and misunderstandings will gradually work themselves out and be replaced by a wholesome spirit of co-operation. "Whitleyism," says Mr. Murray, "is a Magna Charta of team work in industry."

But outside the broader aspects of the functions of works committees there is the domestic side. At present in most undertakings there is no machinery by which exchange of views or even explanations can be given between employés and employed, and we have sometimes the ridiculous position of "disputes" going up to a district council without any proper discussion having taken place between the parties concerned. Or instead of the employers discussing matters directly with the workers in a friendly way, the permanent officials of the Trade Unions are called in to be the intermediaries. The policy of keeping workers at arm's length—or of having meetings together only *ad hoc* when trouble arises—is unworthy as an industrial method in a leading industry such as electricity supply. And it is especially a pity, seeing that constitutional machinery as above mentioned is provided by the Whitley system.

Long-Term Contracts with Russia.

According to a report published from a Russian source in our issue of October 5th, representatives of English firms were being expected in Moscow for the purpose of finally clearing up the question of the orders received by them for the construction of turbo-generators of a capacity of 16,000 kW. In the absence of confirmation of this rumour, the notice was preceded by a note of interrogation. In the meantime a further statement on the subject has been made by Mr. Stomonyakoff, one of the members of the Russian trading delegation in Berlin, in the course of an interview with a Russian correspondent on the matter of trading relations with Germany.

After dealing with the efforts put forth by the Russian delegation in Berlin during the past two years, Mr. Stomonyakoff is reported to have stated that the delegation had recently succeeded in concluding a number of contracts on the basis of long-term credits. In this connection he characterised as extremely important (1) a contract for the purchase of 50,000 kg. of quinine from a German-Dutch concern with a year's credit, and (2) contracts for the delivery of electrical and mechanical equipment for new generating stations in Russia with big works in Czecho-Slovakia and two influential English groups. It was sufficient to compare

these two contracts, the delegate said, with the purchases made by the delegation on a cash basis about two years ago, in order to understand the great progress made by the delegation during this time. These achievements were the result not only of the organisation of the delegation, but also of the monopoly of trading possessed by the Foreign Trade Commissariat (Vneshtorg). Such long-term credits were never obtained before the revolution, either by the Russian Imperial Government or by capitalistic undertakings on the allocation of similar orders. From a political point of view, the delegate considered it desirable to emphasise the fact of the grant of credit to the Russians by English firms which, down to the time of the war, less than all others, granted conditions of credit.

In conclusion, the delegate is credited with the statement that the confidence of foreign business circles in the monopoly of the Russian State trading organisation was constantly increasing, and was expressed, above all, in the growing number of offers to deliver goods on credit. If all the offers did not lead to contracts, this was not by any means due to their being unsatisfactory, but solely to reasons for the limitation of the imports as practised by the National Commissariat for Foreign Trade during the past half-year.

We must leave to the Russian delegation in Berlin the responsibility for the preceding statements. Assuming, however, that they are correct, it would have been more interesting if the names of the two influential English groups said to be concerned had been disclosed by the Russian authority.

Electrical Showrooms.

The subject discussed at the Salesmanship Conference of the Electrical Development Association last week—namely, the development of retail sales of electrical apparatus—raises one of the most important issues with regard to this side of the business. We refer to the scarcity of electrical showrooms in the main thoroughfares of our large cities. When it is considered what an enormous proportion of the general business of the country is done through the medium of window displays, it is astonishing that this side of the subject has not received more attention. It is an admitted fact that a large part of the business in small apparatus, such as irons, toasters, and the like, is falling into the hands of the large retail stores, and this for the simple reason that the public is afforded so few other opportunities of keeping informed as to the latest developments; it goes to the large stores for other things and sees the electrical apparatus in that way. In the West-End of London, for example, how often does one come across a good electrical display in the main shopping thoroughfares? Yet this is one of the finest ways of keeping the electrical idea before the public. It is clearly a matter to be dealt with as between the manufacturing and installation firms and the supply authorities, and raises the old difficulty of preferential rates for electricity for continuous lighting and so on. It is useless for the manufacturers, as in the case of Mr. Roberts at the E.D.A. Conference, to urge this sort of thing when the various parties concerned are unable to work in co-operation.

Hydro-Electric Works in Sweden.

The Swedish Waterfalls Administration has informed the Government that it is not considered necessary to ask for an estimate in the forthcoming Budget for harnessing any fresh waterfalls belonging to the State, as the existing installations are sufficient to meet the power requirements which can be foreseen in the near future, seeing that any considerable increase in the consumption cannot be expected before a material improvement takes place in the condition of trade in general. A similar statement was made a year ago, when the problem of making provision for future developments was under discussion under the same circumstances.

At the same time, the Administration expresses the opinion that the proposed sale of power in a southerly direction from the Trollhatte works to the region of Skane and then to Denmark can hardly be reckoned with. The power which will be required on the completion of the electrification of the Stockholm-Gothenburg railway is destined to be supplied from the hydro-electric works at the Lilla Edet, which is now in course of erection.

The question certainly arises, the Administration says, whether from an economic point of view it would not be more correct to begin the utilisation of some suitably-situated water powers under the present conditions of an unfavourable state of trade in order to have available in a future period of high prosperity a supply of power at a lower price than would be the case if the electrical works were carried out under the operation of the latter state of affairs and the consequential high costs of construction and equipment. But owing to the exceptional circumstances which prevail in Europe at present, it is difficult to form an opinion of the sale possibilities of electric power in the next few years, and it is therefore not deemed advisable to make any proposals for new hydro-electric works. Under these circumstances the Waterfalls administration has limited its requests for estimates to money needed to complete the Lilla Edet station and make certain additions to Trollhatte and the Vasteras power stations.

The Society of Technical Engineers.

Elsewhere in this issue will be found an interesting statement issued by the Society of Technical Engineers regarding its policy and programme. It now proposes that staff councils or committees shall be set up in every engineering works of sufficient size to allow of this; these councils will not necessarily be connected with the Society, nor is the conception entirely new, as such councils already exist in a few cases, and have proved satisfactory and useful. Whilst they were not contemplated under the Whitley system, which strangely ignored the existence of the staffs without which organised industry could not be carried on, in principle they are in harmony with Whitleyism, and indeed there is some analogy between them and the branches of the E.P.E.A. which exist in all large power stations, and which are represented on the National and District Joint Boards.

The objects of the Society are set forth in the statement referred to, and are in general unexceptionable, in some respects even idealistic. It is proposed that the staff councils shall cherish similar objects, working on parallel lines with the Society.

We infer that the leaders of the Society originally intended first to enrol all staff men in its membership, and then to form such councils; and that, finding this plan impracticable, they are now inverting the procedure. Having the fullest confidence in their good faith and high aspirations for the welfare of the industry, we wish them all success.

Municipal Workers on Strike.

A general strike of municipal employés at Fulham, London, which began on Saturday last, has attracted much attention in electrical circles owing to the risk of further developments involving the electricity supply of the borough. The members of the E.T.U. engaged in the electricity department gave notice of their intention to cease work if the dispute were not speedily settled, but as a result of negotiations, it was stated on Tuesday that the notice was not to take effect until the week-end. A special committee of the whole Council was to meet on Wednesday evening, to discuss the matter with representatives of the trade unions concerned, and we hope that the result will be a peaceful settlement of the points at issue.

D

TRADE PROSPECTS IN SAKHALIN ISLAND.

By H. A. FLEET, of Tientsin.

In view of the unsettled conditions of continental countries, British manufacturers for some time have been on the look out for fields to which they can export their manufactured products. The question of who will ultimately have the administration of the Island of Sakhalin is still in the melting pot, but as soon as matters are settled and the proper machinery is put into operation, manufacturers will have a new field of practically virgin ground, in which to become interested and actively engaged in developing engineering enterprises.

Fig. 1.—The Author Topographically Engaged.

The writer spent several weeks in this island during last summer, and was probably the only Britisher resident at that time. He had previously travelled extensively in Europe, India, China, Japan, Siberia, the Far East, Australia, South Africa, Canada, America and other parts, and had been actively engaged in developing British engineering enterprises at home. He is of the opinion that there is a good field for the introduction of machinery and manufactured products to develop the natural resources of the island.

It is situated between longitude 142 and 144 East of

Fig. 2.—Mine Manager's House.

Greenwich, and extends between parallels 46 and 53 North; its latitude is thus about the same as that of the United Kingdom; the maximum temperature in the summer is about 80 Fahrenheit, but in the winter the thermometer falls well below zero. The cold is, however, fine and dry, and beautiful bright days succeed one another. The approximate length of the island is about 590 miles; it varies in breadth from an extreme of about 150 to 20 miles at its narrowest part, and covers an area about the same as Scotland.

It lies almost direct north and south, being bounded on the east by the Sea of Okhotsk and on the west by the Tartary Sea. The 50 parallel of north latitude practically divides its length, and originally formed the boundary between the Russian and Japanese territories. The latter comprises the southern portion of the island, but for the time being the Japanese have taken over the whole of the administration.

In the central part, where most of my time was spent, near to Alexandrovsk, the principal town, and the head-

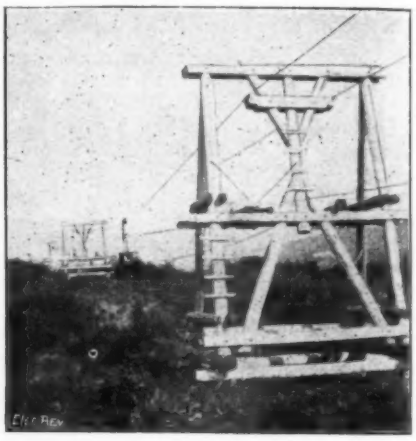


Fig. 3.—A Section of the Aerial Wire Ropeway.

quarters of the administration, there is a long backbone or range of hills having an altitude of from 1,200 to 1,800 feet, covered for the greater part with primeval forest, with miles and miles of splendid timber. Large deposits of coal are known to exist, this being of excellent quality. It is being mined within a distance of four miles, as the crow flies, from the sea shore. The Russians commenced to occupy the island some 70 years ago, when it was used principally as a convict station. There are several miles of good roadways available for transport, these being the result of the labours of

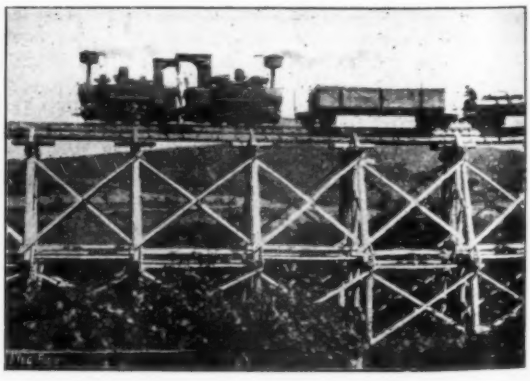


Fig. 4.—A Japanese Railway Bridge.

the unfortunates who in years gone by were sent there into exile, and were kept within the stockade of the convict prison at Alexandrovsk. The houses are practically all built of timber, as there is an unlimited supply of this, and it is easily transported; they are well built, having the inside walls plastered, making most comfortable dwelling quarters. There are also quantities of stone suitable for building purposes, which could be utilised for more substantial and modern up-to-date buildings. Several small streams running down

from the hills are well stocked with trout 8 to 10 inches long, and in the sea by trailing a net about 100 yards long attached to a rowing boat in a semi-circle from the beach, salmon, soles, herring, &c., can be caught by the "cart load." Supplies of caviare are plentiful, and what fish are required for winter consumption are gutted and laid out flat on the roofs of the houses, or hung up on the outside of the walls to be sun-dried and cured, the herring being mostly pickled in salt. Salmon is obtained in great quantities, and it is so rich that it is crushed for fish oil, a quite primitive form of press being used.

During the past three years the Japanese Government has built some 200 miles of railways 2 ft. gauge, equipped with steam locomotives, and 5-ton steel bogie cars. Numerous bridges have been constructed, crossing over the streams and gullies, and these are substantially built of timber. The mining property which I visited is situated by road about four and a half miles due east from the sea shore, and is directly connected by an aerial wire ropeway about three and three-quarter miles long, with a loading stage at the mines and a terminal stage at the beach, and is operated by a semi-portable steam engine built by Messrs. Ruston, Proctor & Co., Ltd., Lincoln.

The various seams of coal outcrop on the sides of the hills, and drifts or adits are driven in to the various levels, and galleries opened out, using one main gallery for haulage or transport; two steam haulages built by Messrs. Clarke, Chapman & Co., Ltd., Gateshead-on-Tyne, are installed.

The longest drift goes in-bye about 700 feet; there is no danger from gas, and naked oil lamps are used. There being a plentiful supply of timber close at hand, the workings are enabled to be maintained in a most satisfactory condition. The coal is of good quality.

In addition to the natural coal resources in the portion of the island which I visited, there is undoubtedly oil in the region further north, as I gathered from trustworthy authorities who had been resident in the island for a number of years and had visited this area where trial boreholes have been made. As a result of these researches, naturally, at the present time owing to the political situation, a certain amount of secrecy is maintained, and the present occupation of the island is probably traceable to the immense importance attached to the supply of coal and oil which was demonstrated to all nations of the world during the recent great war, but in due time this new field will be open for development, and electrical machinery and other labour-saving devices will be largely introduced.

To assist in bringing this about, British manufacturers should realise the importance of having direct representation in the Far East, and employ or co-operate with engineers who have had a thorough practical and technical training at home, and have spent several years in the East and become acclimatised. Such men, having a knowledge of the conditions, are, in the case of industrial development, capable of advising a prospective purchaser, and submitting a comprehensive scheme embodying their latest manufactured products, the most modern methods of application, and the latest practice relative to the nature of the particular undertaking under consideration, which have been tried and proved satisfactory in other parts of the world.

ACCIDENTS AND SHADOWS: THEIR CAUSE AND REMEDY.

By W. E. BUSH (B.T.H. Lighting Service Department).

The fact that of recent years the number of industrial accidents has increased appreciably is rather surprising when one considers the number of safety devices which have been applied from time to time for the sole purpose of making apparatus and machinery "foolproof." It is evident that one must look beyond immediate causes for an explanation of this unfortunate paradox. The provision of emergency switches, guards, and other safety appliances, undoubtedly tends to relieve the number and severity of accidents; but it does nothing to correct the first cause of nearly all accidents, *i.e.*, bad lighting. Workmen do not stumble or put their hands or feet into moving machinery for fun, but usually because they cannot see what they are doing. When serious, and perhaps fatal, consequences ensue the immediate cause, such as unprotected machinery, &c., is blamed; whereas the chief offender is the lighting installation.

Take the case of an operator of a milling machine in a factory at night; the shop floor, especially in the vicinity of the machine, is usually littered with work, thus making it difficult at times to pass from one portion of the shop to another. The operator, in passing round the back of the machine, attempts to step over a heap of work; in doing so he stumbles and, in an effort to save himself, thrusts his hand out and it is trapped in the gears of the machine. The emergency switch is pressed and the motor stops. The switch has justified its existence by operating effectively when required, but it could not prevent the accident, although it certainly limited the consequences. The accident is directly and immediately due to the operator stumbling

Fig. 1.—Shadowless Lighting.

Fig. 2.—Correct Lighting.

over a heap of work and, if the man is requested to give his own opinion, he will probably say that he thought he had cleared the heap. The first and real cause of the accident, however, lies in the difficulty of determining the exact position or contour of an object inadequately illuminated by poor artificial light. It is possible that a portion of the heap of work may have been in a dense shadow and could not be clearly seen, or it may be that the light was not properly diffused.

A certain amount of shadow is necessary if objects are to be clearly seen. A turner cutting a thread on a piece of steel in a lathe can only see the thread because of the shadow which is cast by the thread itself. If the illumination were perfectly even on every portion of the thread, it would appear like a flat surface.

This fact is illustrated in fig. 1, which represents a cabinet containing three pieces of wood of different cross sections. In the cabinet, but hidden from view, a number of incandescent lamps are fixed in such positions that the illumination upon the pieces of wood may be perfectly diffused, or projected from either side to produce shadows of a certain depth. In the illustration the light upon the objects is properly diffused, and they consequently appear absolutely flat and without solidity.

Fig. 2 illustrates the same cabinet and the same objects, but with the light projected from one side. The contours are now quite distinct, and no mistake can possibly be made in gauging the shape of the pieces of wood. The number, length, and density of the shadows cast by an object depend upon certain factors, the most important of which are, probably, the number, position, and area of the light sources.

Deep black shadows are very troublesome, and are a source of constant danger because of what they may conceal. They are a definite cause of accidents, although in the majority of industrial works the systems of electric lighting which produce these shadows are not suspected. This is because electric light is generally accepted to be better than any other light and, therefore, is not considered capable of producing effects likely to be harmful to operators of machines, &c.

Until quite recently industrial lighting problems did not receive the serious consideration they deserve. The general principle appeared to be to install a number of lamps in certain positions without due consideration of the requirements of operators, or the efficiency of the light obtained. Consequently, after an installation had been completed a short time, it was very often observed that workmen had moved the lamps and had tied them in the desired positions with pieces of string. Where lights are juggled with in this manner the result must be general inefficiency.

For satisfactory general illumination in industrial plant the lighting should be such that no shadows are produced that are so dense as to make vision difficult where the direct light from one or two sources is cut off. Again, the shadows should not be so sharply defined as to cause confusion between a machine part and its shadow. That shadows are necessary is proved by the accompanying illustrations, but they should be soft and luminous and not a source of danger to limb and life.

THE WORK OF THE ELECTRICITY COMMISSIONERS.

THE ANNUAL REPORT.

(*Concluded from p.* 598.)

Arrangements for Mutual Assistance: Bulk Supply Agreements.

The policy of the Commissioners with regard to the reorganisation of supply is to bring about the centralisation of generation in the various Electricity Districts by the interconnection of the principal stations, whether new capital stations or the most efficient of the existing stations, or both, and by the gradual elimination of inefficient local generating centres and the substitution therefor of bulk supplies from the central system. With this end in view, it has been the practice of the Commissioners to encourage and promote the linking-up of undertakings and the giving and taking of bulk supplies where such a course is in the ultimate interests of the scheme of reorganisation contemplated for a given district, and also in cases where it has thereby been possible to effect an improvement in the existing organisation in an area not at present included in any electricity district.

At the present time there are over 500 authorised undertakers in Great Britain, some of whom have not yet commenced to supply electricity. In all, 174 bulk supplies have been arranged for, of which 110 are taken by local authorities, and 64 by companies.

In many instances, the bulk supplies are being or will be taken by undertakers not possessing generating stations of their own, but in other cases they are for the purpose of supplementing the resources of local generating stations. Moreover, several of the undertakers included in the above figures take bulk supplies from two or more different sources. The bulk supplies in question are or will be derived from local authority undertakers in about 60 cases, from electric power companies in about 95 cases, and from other company undertakers in about 20 cases. In other instances, supplies are purchased from the owners of generating plant installed for manufacturing or other industrial purposes and from non-statutory undertakings.

The preceding figures are inclusive of bulk supplies which have been in operation for several years past; since the establishment of the Electricity Commission in 1920 51 have been arranged for, and 30 generating stations, 18 owned by local authority undertakers and 12 by company undertakers, have either been shut down entirely, or relegated to the position of stand-by sources of supply.

The formal consent or approval of the Commissioners is not required in the case of bulk supplies derived from private or non-statutory undertakings or in the generality of cases where such supplies are taken from power companies by authorised undertakers situated with the area of supply of such companies. The taking of bulk supplies by local authority undertakers, however, may involve sanction by the Commissioners to the borrowing of money for the purpose.

During the year, the Commissioners approved of certain authorised undertakers making arrangements for mutual assistance in five cases. In the case of two other applications, the proposed arrangements for mutual assistance involved the breaking-up of roads, &c., in districts intervening between the areas of supply of the authorised undertakers who were parties to the respective arrangements, and therefore required the authority of Special Orders, which were made.

Under Section 4 (3) of the Electric Lighting Act, 1909, the Commissioners made two Orders, and under Section 3 of the London Electric Supply Act (1908), approval was given in one case.

In addition to the 10 preceding consents or approvals issued by the Commissioners during the year, other applications were still under consideration on March 31st, 1923.

Financial Assistance.

An important provision with regard to the rendering of financial assistance was allowed by Parliament in the South Wales Electrical Power Distribution Company Act, 1922. Under that Act, any local authority undertaker within the Power Co.'s area of supply may enter into and carry into effect agreements for or in relation to the supply of energy from the Power Co. or from the Treforest Electrical Consumers' Co., Ltd., and in pursuance of such agreement subscribe to the capital and hold ordinary or preference shares or stock in the capital of either or both of the said companies, and may lend money to the companies on the security of any mortgage bond, debenture, debenture stock or prior lien debenture stock issued by them.

Systems of Supply.

During the year the Commissioners approved of the adoption by 22 authorised undertakers of systems of supply other than the systems formerly approved by the Board of Trade in July, 1906. A list of the approvals is contained in an appendix. It appears that there is a growing tendency towards the adoption of a pressure of 33,000 volts for the transmission of energy in cases where arrangements are entered into for the giving and taking of bulk supplies. A noteworthy feature of the year under review has been the number of

applications by authorised undertakers for approval to a change-over from a direct-current to an alternating-current system of distribution. The Commissioners, under their regulations for ensuring a regular and efficient supply of electricity, gave consent to an alteration in the declared system and/or pressure of the supply hitherto adopted in the case of 10 undertakers.

With regard to cases in which it falls to the appropriate local authority to sanction an alteration in the declared system and/or pressure of the supply hitherto given by a company undertaker, the correspondence received by the Commissioners during the year indicated that alterations were contemplated by five company undertakers.

Under the provisions of Section 4 of the Electric Lighting Act, 1888, the Commissioners have served notices and prescribed regulations for securing the safety of the public and for the protection of the electric lines and works of the Postmaster-General in 37 cases where electric lines and works have been erected or laid down without statutory authority. A list of the cases in question is given in an appendix.

Regulations.

For some time past, the Commissioners have had under consideration the question of the revision of the existing code of regulations under the Electricity (Supply) Acts, with regard to the transmission of electrical energy by means of overhead lines. These regulations, which were framed some years ago by the Board of Trade, and provisionally adopted by the Commissioners upon their establishment in 1920, were the subject of review at an early stage in the light of the developments which had taken place since they were first framed. After consideration of the advances in technical practice with regard to the design and construction of overhead line equipment, and of the extent to which the use of overhead lines was likely to play a part in the economical development of supplies in rural and other areas, the Commissioners came to the conclusion that amendment and simplification of the regulations were necessary.

With the object of ascertaining the views of all sections of the electrical industry upon the matter, the Commissioners invited the co-operation of the Institution of Electrical Engineers, and in August, 1920, the Institution appointed a Special Committee to investigate the whole problem. After an exhaustive investigation, the Committee embodied its conclusions in a suggested new code of regulations for overhead lines, which was duly submitted to the Commissioners for their consideration. The Commissioners, as the result of a careful examination, decided to adopt the new code in its entirety subject to rearrangement and to certain drafting amendments, and these matters were in process of settlement at the date to which the report is made.

As indicated in previous reports, the draft of a revised code of regulations for ensuring a regular and efficient supply of electricity and for securing the safety of the public had been prepared by the Commissioners and remitted to the Institution of Electrical Engineers for consideration. This matter, however, has not yet been settled, precedence having been given to the more urgent question of the regulations relating to overhead lines.

Electric Lines and Works of the Postmaster-General.

Early in 1922, representations were made to the Commissioners by the Incorporated Municipal Electrical Association on the subject of the relationship between the electricity supply industry and the General Post Office under the provisions of the Electricity (Supply) Acts and the Telegraph Acts. These representations had more particular reference to the question of protection as between overhead and underground lines and mains belonging respectively to authorised undertakers and to the Postmaster-General, especially in cases where the lines or mains of the Postmaster-General were erected or laid subsequent to those of authorised undertakers.

Owing to the demands upon their time during the passage of the Electricity (Supply) Bill, 1922, through Parliament, the Commissioners found it necessary to defer consideration of this matter. In August, 1922, however, they convened a joint conference at Gwydyr House, which was attended by representatives of the Incorporated Municipal Electrical Association, the Incorporated Association of Electric Power Companies, the Provincial Electric Supply Committee of the United Kingdom, and the General Post Office. At that conference the various aspects of the matter were discussed in detail without prejudice to the interests concerned, and suggestions were made as to the manner in which the operations of authorised undertakers might be assisted through closer co-operation with the technical officers of the General Post Office.

The great developments which may be confidently expected in connection with the public supply of electricity and in connection with the extension of the public telegraph and telephone services will involve a constantly growing association between the supply industry and the General Post Office, and the efficient service of all the public interests concerned will necessitate the closest possible co-ordination of action. This matter is of particular importance from the point of view of the Commissioners, having regard to the duty laid upon them of promoting, regulating, and supervising the supply of electricity, and they are accordingly taking such steps as lie within their power to bring about the desired end.

Fringe Orders.

The Commissioners granted 59 Orders during the year, permitting various authorised undertakers to supply electricity to specific premises situated outside their respective areas of supply. Nineteen Fringe Orders previously granted to certain authorised undertakers in respect of premises situated in the areas of supply under suspended electric lighting Orders were revoked, the coming into operation of the latter after the war having rendered the powers conferred by the Fringe Orders redundant.

Accounts, Returns and Statistics.

Three forms of annual statement of accounts have been prescribed for the use respectively of local authorities, electric lighting companies, and power companies. The Commissioners have under consideration the question of prescribing new forms embodying certain modifications which experience has shown to be desirable.

During the year ending March 31st, 1923, the Commissioners received four-weekly returns of fuel consumption, units generated, &c., in respect of all the generating stations (numbering 426) belonging to authorised undertakers in Great Britain. In addition voluntary returns were submitted to the Commissioners in respect of 71 generating stations owned by railway and tramway authorities, and of 35 stations owned by non-statutory undertakings. The total figure of 532 stations represents a reduction of four as compared with the previous year, owing to certain stations having been shut down or having been out of operation.

[Summaries of the figures for the past year were given in the Electrical Review for September 7th, 1923.]

As compared with the consumption of coal and coke in the year 1920-21 the following year witnessed a decrease of about 12 per cent., and the year 1922-23 a decrease of about 8 per cent., the figures for the latter year representing an increase of approximately 4.5 per cent. upon those for the year 1921-22.

It will be observed that the percentage decrease in coal consumption in 1921-22 was greater than the percentage decrease in units generated; and that the percentage increase in coal consumption in 1922-23 as compared with 1921-22 was smaller than the corresponding percentage increase. About 94 per cent. of the total units are generated from coal and coke, and the average consumption throughout the country per unit generated progressively decreased during the three years 1920-23 in the approximate ratio of 100 :93 :83.

Subscriptions to Associations.

During the year the Commissioners issued 18 consents to the payment by authorised undertakers out of revenue of their undertakings of subscriptions to the following associations:—

(i) The British Electrical Development Association (Inc.) (4 local authorities and 1 company).
(ii) The British Engineering Standards Association (1 local authority and 1 power company).
(iii) The Incorporated Association of Electric Power Companies (1 electric power company).
(iv) The Incorporated Municipal Electric Association (10 local authorities).

In the case of the majority of the applications relating to the Incorporated Municipal Electrical Association consent was also given to the payment of the reasonable expenses of attendance of members or officers of the authority at meetings of that Association. The Commissioners issued to the Secretary of the Employers' Side of the District Joint Board (No. 10) Greater London Area, general consent to the payment by local authority undertakers in the area of an annual contribution towards the expenses of the Board at the rate of £1 per million or part of a million units sold by each undertaking.

Charges for Electricity.

By the Electricity (Supply) Act, 1922, the ordinary period of revision of maximum prices was reduced from five years to three years, and it became open to all authorised undertakers to apply for such revision at any time after the expiration of three years after the date when the undertakers were granted their powers of supply, or after the date of the last previous revision.

The Commissioners dealt in all with 48 applications made to the Minister of Transport, as compared with 50 during the preceding year, and 200 during the period covered by their first annual report. Of the 48 applications, 47 were by company undertakers and the other by a local authority undertaker, practically all the applications relating to small electricity undertakings, which, as a class, had been most severely affected by the changed economic conditions following the war. Two applications were subsequently withdrawn, leaving 46 cases on which recommendations were eventually made to the Minister by the Commissioners. It was decided that local inquiries into 12 of the applications made by company undertakers were advisable; eleven of these cases had not been finally dealt with at the date to which the report was made. With regard to the other 35 applications, the maximum prices recommended by the Commissioners ranged from 1s. 2d. to 8d., there being 17 at 1s. and 11 at 10d. In the majority of cases the maximum prices recommended did not exceed those previously authorised.

Overhead Lines.

There was a large increase in the number of applications for consent to the erection of overhead lines, 95 applications being dealt with by the Commissioners during the year, as compared with 46 applications during the preceding year and 34 applications during the period covered by the first annual report. The Commissioners recommended the Minister of Transport to give his consent to each of the above-mentioned applications, subject to a power being reserved to the Minister to review the situation at the expiration of a period of five years, and subject also to the Overhead Line Regulations of the Commissioners being prescribed upon the undertakers in each case in respect of the proposed works.

Wayleaves.

The Commissioners dealt with six applications for consent to wayleaves in connection with the placing of electric lines. In one case the application was withdrawn; in each of the other cases the Minister of Transport caused a local inquiry to be held. One of the applications was by the Northwich Electric Supply Co., Ltd., and consent was sought to a wayleave for an overhead line across a branch railway of the Cheshire Lines Committee. The Committee had expressed its willingness to agree to the placing of an underground cable across the branch line, and after consideration of all the circumstances the Minister refused his consent to the desired wayleave.

Consents to wayleaves across certain lands were granted in respect of three applications made by the Newcastle-upon-Tyne Electric Supply Co., Ltd. One case related to an overhead line from Newbiggin-by-the-Sea to Linton Colliery, and the wayleave rental was fixed by the Minister at 15s. per annum for each H-pole erected by the company on the land of the owners in question. The other two cases related to a 66,000-volt overhead line from Dunston to Bedlington, involving the erection of large "tower" poles or masts, and the wayleave rental was fixed by the Minister in each case at 25s. per annum for each such pole erected by the company on the lands in question, and in addition 1d. per lineal yard of line across the said lands.

Consent was granted to a wayleave for an overhead line across certain land at Tinsley Wood Tunnel, belonging to the Great Central Railway Co., the wayleave rental being fixed by the Minister at 10s. per annum, and the Yorkshire Electric Power Co. being required to defray the cost of placing the railway company's telegraph circuits underground at the point of crossing.

In the course of a conference held by the Commissioners in November, 1922, it was suggested that the framing of a tariff applicable to the electric lines of authorised undertakers would facilitate negotiations for wayleaves and tend to prevent undue demands by the owners or occupiers of private property for wayleaves across their land. After a review of the circumstances the Commissioners came to the conclusion that it would not be practicable to attempt to draft a general tariff.

Organisation and Staff.

There was a substantial increase during the year in the volume of work dealt with by the Commissioners, and they found it necessary to augment their staff. With the approval of the Minister of Transport the Commissioners appointed a solicitor and three other officers to their established staff, and a further officer to their temporary staff. On March 31st, 1923, the staff numbered 46 in all, and consisted of 24 established officers and 22 temporary officers. The estimated cost of administration for the year exceeded the estimated receipts by £44,000, and the liability to H.M. Exchequer in respect of the first annual instalment in repayment of the advances made to the Commissioners during the two preceding years (together with interest) amounted to £35,000. The total amount to be apportioned among authorised undertakers was therefore £79,000.

The actual net expenditure on administration during 1922-23 was £35,566, a saving of £8,434 on the estimate. A further saving of £646 on the estimated interest charges was also effected. Of these savings the sum of £4,566 was applied to the further reduction of the outstanding balance of advances repayable to H.M. Exchequer. A detailed statement of account and a balance sheet indicating the position of the Electricity Fund at March 31st, 1923, are given in an appendix. The outstanding liability of the Commissioners at that date in respect of advances from H.M. Exchequer during the period January 31st, 1920, to March 31st, 1922, and accrued interest thereon, amounted to £56,000. The certified returns submitted to the Commissioners showed that 3,888,234,000 units were generated by or on behalf of all authorised undertakers in Great Britain during the year 1921. Apportionments were made on authorised undertakers in June, 1922, the contributions by the electricity supply industry towards the expenses of the Commissioners for 1922-23, inclusive of repayment to H.M. Exchequer, thus involving a payment by each authorised undertaker concerned amounting to 4.9d. per 1,000 units generated. By Section 7 of the Electricity (Supply) Act, 1922, the basis of apportionment in subsequent years was altered from units generated to units sold. A form of return in accordance with the Act was issued in January, 1923, for the purpose of the subsequent apportionment of the estimated expenses of the Commissioners for 1923-24 when approved by the Minister of Transport. The certified returns showed that the "units of electricity sold" during the year ending December 31st, 1922, amounted to 3,645,190,732. (Apportionments were made in June, 1923, on the basis of 4.9d. per 1,000 "units sold.")

THE CAMBRIDGE REMOTE INDICATOR.

The development of large interlinked networks, necessitating the adoption of centralised control, has brought with it an urgent need for continuous information as to what is taking place at various remote points on the system. Where attendants are present, the telephone can be used, but this method involves several obvious disadvantages. Current indications can be transmitted by pilot wire, but a.c. power readings cannot be indicated thus by ordinary methods. However, if the indications can be transmitted in the form of direct current, the difficulty is overcome; the d.c. instruments available require only one twenty-five thousandth part of the power to actuate them, namely, 0.4 microwatt, as compared with the most sensitive a.c. instruments, which need 10,000 microwatts, distortion in the pilot wires is obviated, and two wires suffice instead of four.

Mr. E. Fawsett, of the Newcastle Electric Supply Co., some years ago devised and patented ingenious methods of converting the local a.c. indications into equivalent direct current for transmission to the distant station; his system has been in successful operation for five years between two power stations eight miles apart, and is now indicating power up to 80,000 kW and currents of the order of 10,000 A. By suitable modifications, voltage, current, power, or power factor can thus be indicated many miles away, at small cost. The principle is embodied in the "Cambridge Remote Indicator," made by the Cambridge and Paul Instrument Co., Ltd., which operates as follows:—

A thermo-pile is warmed by a heater which carries a submultiple of the alternating current it is desired to measure. The direct current voltage generated by the thermo-pile is proportional to the square of the alternating current applied to the heater. At full load on the heater, the electromotive force given by the thermo-pile may be as great as 40 millivolts. This is sufficient to operate a high-resistance indicator through a pilot wire of at least 1,000 ohms resistance. This resistance will readily allow of an indication of current or power at a distance of twenty or more miles, assuming that the pilot wire is of No. 18 or 3/22 S.W.G., having a resistance of approximately 24 ohms to the mile.

The thermo-pile, which is illustrated in fig. 1, consists of a number of thermo-junctions mounted in series; it is mounted above a resistance (the heater). The millivolts generated by

Fig. 1.—Heater and Thermopile of Cambridge Indicator.

the thermo-pile are measured by a Cambridge "Unipivot" microammeter, or by a recording instrument.

Voltage.—Referring to the diagram, fig. 2, if P and Q represent the power lines between which it is desired to indicate the voltage, a potential transformer P T is placed across the lines, the secondary of which is connected through a resistance

R to the heater H of the thermo-pile E. The millivolts given by the pile are proportional to the square of the a.c. voltage, and the Unipivot G is calibrated accordingly. This type of scale is specially suitable for indicating voltages near the maximum.

Current.—In fig. 3, C T is a current transformer of which the primary is inserted in the power circuit, the secondary being connected to the thermo-pile heater. The heater is made of lower resistance and more robust for current measurement on account of the necessity to withstand reasonable overloads. The scale of the Unipivot follows a square law.

Single-phase Power.—If a current corresponding to the voltage and also one which is a sub-multiple of the power current be applied to a heater, then the e.m.f. generated in the thermo-pile is proportional to the square of the vector sum of the two currents, that is $(V+A\cos\theta)^2$, θ being the angle between the two. If a second heater be energised by the same two quantities but with the sign of the A term reversed, the e.m.f. generated in the corresponding thermo-pile will be proportional to $(V-A\cos\theta)^2$. If then the two thermo-piles are connected so that the e.m.f.s are in opposition, the resultant e.m.f. shown by the indicating instrument will be proportional to $(V+A\cos\theta)^2-(V-A\cos\theta)^2$, which is proportional to $V A\cos\theta$, the power of the circuit, and the indicator scale will follow a straight-line law. Fig. 4 illustrates this method of indicating power. The two current transformers T_1 T_2 have exactly similar secondary windings, the primary being common to them both. They are each connected to a heater, but in opposite senses, and in such a way that they operate independently. The heaters are also connected in series to the secondary of the potential transformer T_3 so that they are traversed by a current which is proportional to the voltage of the circuit to be measured, the total current in each heater being usually not greater than 0.2 ampere. It is evident that if the load current is in phase with the pressure, the instantaneous superimposed currents are additive in one heater and in opposition in the other, so that one will be at a higher temperature than the other, hence the e.m.f. generated in one thermo-pile will be larger than that generated in the other. If, therefore, the piles are connected in series with a millivoltmeter but with their e.m.f.s in opposition, the deflection on the instrument will be proportional to the difference between them, *i.e.*, to the power of the circuit. If the two heaters are energised by equal currents from the current transformers only, or by the same current from the potential transformer only, there will be no deflection on the millivoltmeter. When they are energised from the two sources simultaneously, there will be a deflection proportional to the power, which deflection is accurate at all power factors. If the millivoltmeter is fitted with a centre-zero scale, it is possible to measure the transference of power in either direction—a considerable advantage where power stations are interlinked.

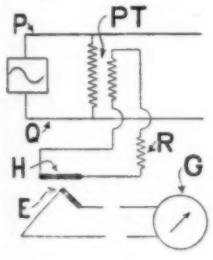


Fig. 2.

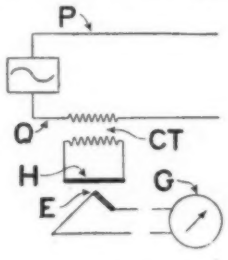


Fig. 3.

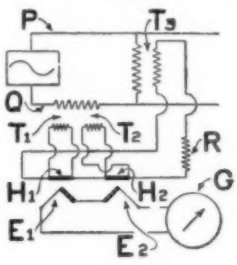


Fig. 4.

A modification of the wiring for the indication at a remote point of wattless power consists of the employment of a condenser in the voltage circuit instead of a regulating resistance as shown at R in fig. 4.

Three-phase Power.—In the case of three-phase circuits it is usual under balanced conditions to refer to the current in one phase and the pressure between that phase and the neutral, or to the power as obtained by the two-wattmeter method (in the latter case the Unipivot indicates the true power).

It is further possible by the addition of a sufficient number of heaters and transformers to obtain a true indication of the algebraic sum of the loads in any number of lines.

Power Factor, &c.—By suitably combining the circuit arrangements, the apparatus can be made to give indications at the central station of power factor at any remote point. The synchronism of two supplies can be tested by feeding one heater in opposite senses from two potential transformers, one on each supply. So long as these are in synchronism no e.m.f. is generated by the thermo-pile, but should the machines get out of step an oscillating e.m.f. is transmitted to the millivoltmeter, and should one machine shut down a steady deflection is produced.

Protective Relay.—As the factor of safety of the heaters is unavoidably low, a protective relay should be included in the current circuit, with specially small time lag to short-circuit the heaters if the current exceeds a predetermined amount. A simple electromagnetic a.c. relay operates a spring controlled cut-out switch in one half cycle on the current rising above the safe value, and restores the circuit on the current falling below that value. This arrangement has dealt safely with large numbers of overloads and short circuits.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

"Siluminite" Switchboards.

Tests recently carried out at Faraday House appear to bear out the claims made by the Siluminite Insulator Co., Ltd., The Green, Southall, Middlesex, for its "Siluminite" switchboard panels. In comparing this material with marble or slate, the firm states that it is lighter and stronger, sheets of thinner section can be used, and the composition is free from metallic veins. In addition to these qualities, the material is unaffected by hot oil, does not warp at high temperatures, is of high dielectric strength, and is easily machined. A polished sheet 3.4 mm. thick was tested and broke down at an r.m.s. pressure of 23,800 V, giving a result of 9.9×10^5 megohms per cm. cube. After 24 hours' immersion in water, the specific insulation was only lowered to 9.4×10^5 megohms per cm. cube. A sprayed sheet 3.84 mm. thick gave results of 10.1×10^5 and 8.0×10^5 megohms per cm. cube under dry and post-immersion conditions. The company has also introduced a new material, "Arcovite," which is suitable for arc shields and for the supports of resistance coils, being strong and free from carbon.

Medium-duty Oil-break Switches.

The English Electric Co., Ltd., Queen's House, Kingsway, W.C.2, has issued a new pamphlet (No. 453) describing in detail the construction of its oil-break switches for medium duty. One of these, a 1,000-A, triple-pole switch, is illustrated in figs. 1 (closed) and 2 (open). The switch frame is a casting suitable for mounting on angle-iron runners, or on a vertical panel or wall, as in the illustrations. The insulators are of vitreous porcelain, having ample creeping surface, and they are securely cemented into flanged plates which are bolted to machined facings on the top casting. The copper stalks carrying the contacts pass up through the insulator and terminate in a threaded portion to which the connections can be made by rod, strip, or cable as required. The stationary contacts are of the spring-finger, self-adjusting type, consisting of a number of hard-drawn copper fingers secured to a solid brass base. The individual fingers are pressed firmly on to the moving contact bars by means of articulated steel springs. The tips of each finger are shaped so that the arc is drawn away from the contact surfaces to prevent pitting. The moving contact bar for each pole is built up of copper bar and strip so as to form a wedge section. Each bar is secured to a plain porcelain barrel insulator with sufficient freedom to ensure good and even contact.

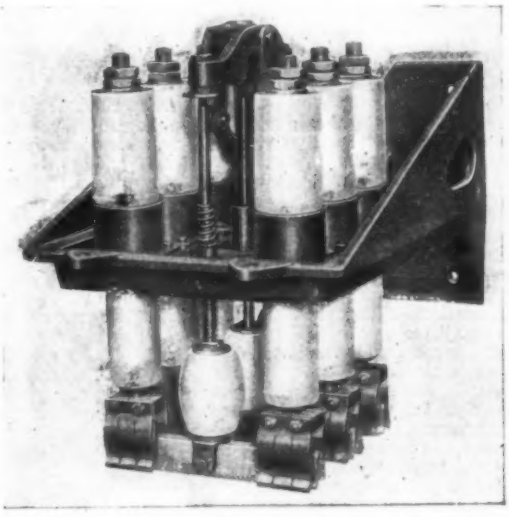


Fig. 1.—Three-pole Oil-break Switch (Closed).

The insulator is connected to the contact bar and lifting rod by the use of special threaded metal plugs so designed and secured as to prevent any stress being transmitted to the porcelain by their expansion or contraction. The tanks are of sheet steel, with three-ply wood lining, and in the case of triple-pole switches three-ply wood barriers are fitted between the phases. The operating mechanism embodies a throw-off spring giving a high speed of opening. If desired,

a buffer resistance can be fitted inside the tank to limit the current rush when the switch is closed.

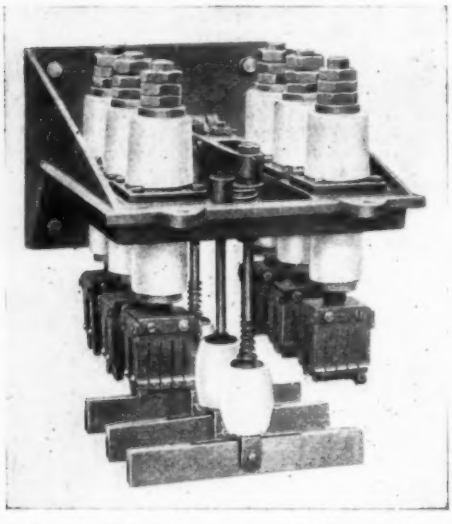


Fig. 2.—Three-pole Oil-break Switch (Open).

The switches are made to take up to 6,000 A at 660 V and 1,200 A at 11,000 V, with intermediate currents and pressures.

"Balanced-wheel" Electric Vehicle Drive.

An important feature of any electric vehicle is the way in which the driving power is transmitted by the motor to the wheels.

The system adopted by Walker Vehicles, Ltd., Caxton House, Westminster, S.W.1, appears to be a very efficient arrangement. In this device (fig. 3) the motor is situated in the hollow rear axle, and the case is hinged so that the upper part of the field and the brush gear can be lifted clear for inspection and repairs. There is a differential directly connected to one end of the armature shaft, and from the differential sockets into the centre of each rear wheel, two driving shafts extend with a pinion on the wheel end of each. This pinion engages with two idler wheels which, in turn, engage with a circumferential gear mounted on the inside of the wheel rims. The wheels are of the steel disk type, and the gears are thus protected from dirt and water. This system of drive is the result of an endeavour to eliminate unbalanced couples, and power is transmited in a steady balanced manner right to the rims of the wheels.

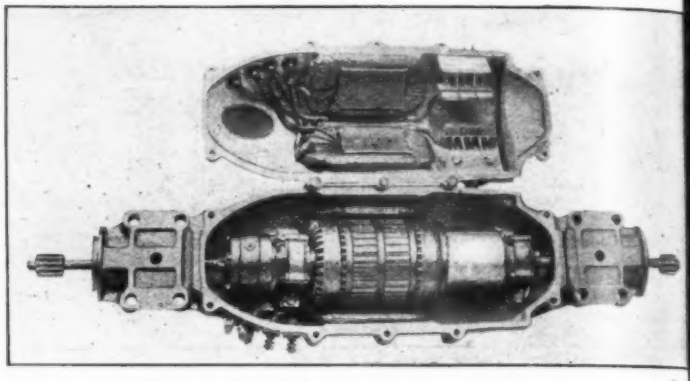


Fig. 3.—The "Walker" Electric Vehicle Drive.

It is claimed that an efficiency of 95 per cent. is obtained

PROMOTING RETAIL ELECTRICAL SALES.

The subject discussed at the second Salesmanship Conference of the Electrical Development Association this Session—which was held on Friday, October 19th, when Mr. S. T. Allen, chief electrical engineer, to the Wolverhampton Corporation, presided—was how to organise and promote retail showroom sales.

Mr. H. W. Roberts (General Electric Co., Ltd.,) introduced the subject, and the main idea running through all that he had to say was the imperative necessity for keeping in close touch with the public in general and existing consumers of electricity in particular. His main argument was that they should make electrical showrooms as common as grocers' or drapers 'shops, and so bring the public to consider the purchase of a piece of electrical apparatus as commonplace as buying something from these other shops. He specified three essentials in this connection: First, the public must be brought to abandon the idea that electricity and electrical apparatus were dear; secondly, the public must be taught to think electrically; and thirdly, electrical shops must be established in every market place or busy shopping street in every town.

Energy should be sold by the 1,000 watts, and all sales talk should be on the basis of consumption in watts. Local co-operation was urged as the best means of educating the public to think electrically, and the work of the electrical leagues in America, acting through the central Development Association, was quoted. Such electrical leagues should be formed here.

It was urged that electrical shops should be established in the main shopping thoroughfares next door, wherever possible, to a shop which the ladies used daily, say the grocer's. As to layout, the long and narrow shop was favoured, with a platform in the window, over which the remainder of the shop could be seen from the street. The window should be devoted to demonstrations of working apparatus, whilst inside there should be a retail counter and showcases of apparatus. Female assistants were recommended for the reason that they would be better able to talk on domestic subjects, and as an encouragement, there should be a commission on apparatus sold. Again, as a further aid to efficiency, assistants should be made to specialise upon a certain subject and given a little time off each month to visit the wholesaler's premises and see the latest apparatus and methods.

Sales methods were next discussed, and emphasis was laid on the need for installing extra points when putting in wiring for lighting. In connection with window dressing, the great desiderata were to change this every two or three days, to adopt attractive schemes of lighting, and to put in moving apparatus. Passing on, Mr. Roberts referred to the largest central station showroom, he believed, in the world, *viz.*, that of the Commonwealth Edison Co., in Chicago, which was situated in one of the most expensive quarters, and occupied a large area with a series of shops down two streets. Service, he said, was the keynote of the organisation in this case, as in the case of similar companies such as the New York Edison Co., and the Pacific Gas & Electric Co., in San Francisco. All irons were repaired free; 60-watt lamps were given away, accounts were rendered monthly, and coupons were given away at the tobacconists' and other shops entitling the holder to some sort of present—not necessarily electrical—which, however, had the advantage of bringing people into the showrooms where a large number of people were always found buying electrical apparatus. Some of the American central stations subsidised the contractors in respect of the cost of putting in extra outlets for energy consumption, and so helped to keep down the cost to the customer. Moreover, a great deal of hire-purchase business was done in America. A huge campaign was being launched in the States in favour of better wiring, and something on these lines in this country would be beneficial, having regard to the recent flood of cheap and nasty foreign wiring and apparatus.

After condemning the sale of apparatus on "sale or return" terms, and the giving of long credit, and strongly urging contractors to see that their customers were kept fully informed as to the latest apparatus and given introductions to the wholesalers so that they could go and select what they required, Mr. Roberts referred to the tendency for the trade in irons, toasters, and other electrical apparatus to pass into the hands of the large stores. This tendency he believed to be due to the absence of electrical shops in the local shopping centres; the consequence was that people actually wanting apparatus and unable to get it locally, naturally turned to the big retail stores.

Discussion.

Mr. P. M. Shears (sales manager, Hackney) dwelt upon the success which had attended the campaign for the extended use of electrical apparatus in Hackney, and said that the hire-purchase system had been very successful there. They invariably adopted the principle of selling electricity on the wattage basis, and talked always in terms of £ s. d. In dealing with non-consumers, an interview in the home was the first essential, and the use of technical terms must be dropped.

Alderman Mrs. Hammer (Hackney) said it had been proved

in Hackney that women must help in the sale of electricity, in the showrooms, as well as on committees and councils. When the saleswoman at Hackney had a few difficult consumers to deal with, Mrs. Hammer usually helped to put things right, and she related how, by entertaining dissatisfied users of cookers at her own home and demonstrating to them, she had sent them away filled with enthusiasm. She believed that the award of prizes for cooking by electricity would catch on. At Hackney the electricity department undertook the maintenance of cookers which were hired to consumers, but many such consumers were unaware of it. One of the department's workmen had been responsible for giving them the opposite impression, and she would not have been surprised if the gas people had got hold of that man. This emphasised the importance of educating the workmen to push sales.

Mr. R. Robson (Newcastle) expressed the opinion that the industry did not understand the immense field in front of it. Co-operative advertising should be carried out locally, and manufacturers should advertise nationally; the latter would find it beneficial to advertise their goods under a trade name. As for showrooms, the chief salesman should be an electrical engineer, and his assistant a woman; commission should be paid, not on single articles, but on the whole profit of the shop over a certain period.

Mr. Varcoe (Birmingham) suggested that a movement emanating from electrical undertakings first, and then including manufacturers and retailers, should be brought about to popularise the electric iron; his experience was that once that was brought into the home, other apparatus followed easily.

Mr. E. A. Joyce, commenting on the shortage of electrical showrooms in London, said he believed there was only one shop in Oxford Street which could really be called an electrical shop. Contractors probably considered it beneath their dignity to become shopkeepers. If any contractor in the room was going to open a showroom, he would try to get goods on sale or return. A Salesman should have a general knowledge of the materials he was selling, should be courteous, and should take particular notice of details, especially complaints. Also, he should have information as to the voltages in the various districts, which was available in book form, and the regulation price of energy, which was published periodically. As to hire-purchase, the contractor should have some interest in it, and that could be arranged quite easily.

Mr. H. T. Young (Messrs. Troughton & Young), urging the importance of national advertising in the daily Press, said the public went to chemists' shops, for instance, for things which were advertised widely by the manufacturers, and the same thing should apply in the electrical industry. With regard to goods on approval, he had been successful in selling a fitting in 99 cases out of 100, where he had put it up for a consumer in the room in which it was to be used, so that the consumer could see the exact effect it would have. He did not blame a contractor who could furnish his showroom with goods "on sale or return," and so keep his capital in the bank. If the manufacturer were prepared to do it, the retailer would be a fool not to take advantage of it. He preferred men for selling rather than women.

Miss Walker (North Metropolitan Co.) held that the women sellers could talk to other women better than men with regard to cooking, &c., and, by reason of their better artistic taste, could make a showroom more attractive. Goods sent out on free trial to consumers were often never returned, and she did not favour goods to contractors on sale or return, because her experience was that they were never sold, and should make way for newer articles.

Mr. Mann pointed out that the B.T.H. Co. and the Holophane Co. had given a lead in the direction of demonstrating their goods to salesmen, and urged the importance of this practice. He referred to the damage done to the industry by inferior wiring, and emphasised the importance of ensuring that wiring was of good quality. In agreeing with the wattage basis, he asked that manufacturers should label their goods in watts, instead of amperes and kilowatts.

Mr. W. A. Gillott urged the importance of demonstration, because the mere reduction of the price of energy was not sufficient inducement to the public to use electricity. Also, show windows should be dressed on unsymmetrical lines, and changed more often.

Mr. E. J. Howell referred to instances in which he had seen showroom windows badly dressed, with out-of-date apparatus, and the apparatus in the showroom not ready for use. It was useless to have a showroom if the apparatus could not be demonstrated when customers entered. Also, he appealed for cleanliness.

The Chairman commented on the enthusiasm and co-operation apparent in the industry at the present time; if these were attained, other things would follow. He did his best to help contractors, as a supply engineer, and there was a good deal of enthusiasm at meetings which he held with them in his district.

Mr. Roberts, replying to one or two of the points raised in the discussion, said that the Americans had now stopped giving lamps away, having succeeded in building up their loads. It must not be considered that America was completely electrified; only about 30 per cent. of the houses there were wired. With regard to national advertising by manufacturers, the question was whether the manufacturers should give the lead by advertising right away, or whether the contractors should first establish their shops. In conclusion, he emphasised the need for the insertion of electrical puffs in the daily Press; the electrical Press might help there, and he suggested the formation of an Electrical Editors' Development Association. In conclusion, he said he advocated the registration of contractors as a remedy for bad wiring.

BUSINESS NOTES.

Bankruptcy Proceedings.—Cyril Walter Stocken and Conway Fink, trading as the Wyndham Radio Supplies, 80, Redcliffe Street, Bristol.—The public examination of these debtors was held on October 12th at the Guildhall, Bristol. The statement of affairs showed a deficiency of £407. It appeared that debtor Fink commenced business as an electric lamp factor in London without capital, and as the business was not a success, he agreed to pay his liabilities of about £130 by instalments. Debtors started trading together at Narrow Wine Street, Bristol, in 1922 without capital, Fink still owing the money. They stated that they did not become aware of their position until July, when they were pressed by creditors. The examination was adjourned.

F. J. Matson (Sunnyvale Engineering Co. and Magandynamo Co.), automobile electrical engineer, 24, Rider Street, and Asquith Street, Woodhouse, Leeds.—First meeting, October 29th, at the Official Receiver's office, 24, Bond Street, Leeds. Public examination, November 6th, at the Court House, Leeds.

H. B. West, electrician, 3, Clyde Street, Canterbury.—Last day for proofs for dividend, November 3rd. Trustee, Mr. A. H. Ward, Official Receiver's office, 10, Burgate Street, Canterbury.

D. Bould, motor and electrical engineer, Burn Croft, Birchencliffe, Huddersfield.—Last day for proofs for dividend, November 3rd. Trustee, Mr. W. Durrance, Official Receiver, 12, Duke Street, Bradford.

T. Slater (Slater Bros.), electrical engineer, 47, Greenhill Road, Cheetham Hill, and 25, Dickinson Street, Manchester.—Last day for proofs for dividend, November 3rd. Trustee, Mr. J. G. Gibson, Official Receiver, Byrom Street, Manchester.

W. Micklethwait, electrician, 2, Coronation Grove, Oatlands, Harrogate.—Order for discharge forthwith made September 25th.

Company Liquidations.—Morgan & Taylor's Radio Electric, Ltd.—Winding up voluntarily. Meeting of creditors at the office of the liquidator, Mr. S. E. Clutterbuck, 31, Queen Street, Cardiff, on October 26th. Particulars of claims by November 19th.

Mitchell's Electrical and Wireless, Ltd.—Winding-up order made by the High Court on October 16th.

Wireless Installations, Ltd.—Winding-up order made by the High Court on October 16th.

William J. A. Keene, Ltd., electrical engineers, 10, North End Road, Golders Green, London, N.W.—A meeting of the creditors of the above was held on October 22nd, at the Institute of Chartered Accountants, Moorgate Place, E.C. The chair was occupied by Mr. A. C. Herring, C.A., of 90, Cannon Street, E.C., who had been appointed to act as the liquidator in the voluntary liquidation. The statement of affairs presented showed liabilities of £2,183, all of which were due to unsecured creditors. After allowing £151 for execution creditors and £74 for preferential claims, the assets were estimated to realise £213, or a deficiency of £1,969, so far as the creditors were concerned. The liquidator reported that a petition for the compulsory liquidation of the company had been filed by Messrs. Cakebread, Robey & Co., and had been adjourned. It had been hoped that it would be possible to sell the business as a going concern. The premises were held on a lease and could only be sublet for the purpose of an electrical engineer's business, and the market was therefore somewhat restricted. The landlord had distrained for rent, and two other executions had been levied. A debenture for £592 had been issued, but that would be withdrawn. The liquidator added that he was afraid that unless money was found to pay out the landlord no useful purpose would be served by continuing the voluntary liquidation. The company paid £100 for the lease of the premises, and had spent nearly £700 in alterations. In answer to questions, the liquidator said that the debentures were issued for a past consideration within three months of the liquidation taking place, and, consequently, the holder could not rank in priority to the trade

creditors. The company was formed in October, 1920, when it took over an existing business. The petitioning creditors stated that they had heard about a loss of £3,000, and wanted to know what became of the money realised from the sale of a branch business at Palmer's Green. The liquidator replied that the money was utilised in the business.

After some further discussion the petitioning creditors intimated that they proposed to proceed with their petition, and the liquidator stated that it would not be opposed. The meeting broke up without any resolution being passed. The principal creditors are:—

	£		£
Cakebread, Robey & Co. ...	99	Sun Electrical Co.	77
Electrical Supplies Co.	38	Thomas & Co.	45
Demaid, Ltd.	35	Saunders, Probert & Saunders...	50
General Electric Co., Ltd. ...	89	Kendall, J.	592
Knowles, J. N., & Co.	120	Keene, W. J. A.	484
Parker, C. W.	61	Ebner & Co.	30
Skinner, T. R., & Co.	53		

Stols Electrophone Co., Ltd.—First and final dividend of 4s. 10 43/44d. in the £, payable at Carey Street, W.C.

British Scientific Apparatus Manufacturers, Ltd.—Particulars of claims by November 22nd to the liquidator, Mr. J. H. Mitchell, 90, Cannon Street, E.C.

Dissolutions of Partnership.—Thobec Electric Supplies, general electrical engineers, 26, Victoria Street, S.W.—Mr. R. D. W. Thompson and Mr. G. N. Buckton have dissolved partnership. Mr. Buckton will attend to debts.

Trade Announcements.—Mr. J. C. White, of Manchester, announces that Mr. H. O. Bishop, late of the Edison Swan Electric Co., Ltd., and British Insulated and Helsby Cables, Ltd., will shortly be joining his staff as sales manager.

Mr. Geoffrey Widdowson has commenced business as an electrical contractor at 27, Derby Road, Nottingham, and desires to receive electrical catalogues and price lists.

Anglo-Overseas Engineers and Merchants, Ltd., have removed their offices to Oswaldestre House, Norfolk Street, Strand, London, W.C.2.

Mr. H. G. Westlake, electrical engineer, Fountain Street, Halifax, has opened new showroom premises.

Mr. M. F. Ridgway has commenced business as an electrical engineer at 2, Strickland Gate, Kendal.

The St. Helens Cable and Rubber Co., Ltd., of Slough, has opened a branch office situated at 30, Wood Street (off Deansgate), Manchester, where large stocks of C.T.S. and v.i.r. cables are carried, also solid band tires and "Everlastic" tubes. The branch is for the convenience of Lancashire and Cheshire customers who hitherto have been served direct from the late Warrington works.

The address of the Wax Electric Light Tube Manufacturing Co., Ltd., has been changed from Lancaster Gate to 35, Great Pulteney Street, Regent Street, London, W.1. (Telephone No.: "Regent 583.")

Mr. H. Powell has commenced business as an electrical engineer at 27, Lymington Avenue, Leigh-on-Sea, Essex.

Messrs. C. W. Spivey & Co., of Heckmondwike, have opened a branch at Burley-in-Wharfedale as the Wharfedale Electric Co. Catalogues are desired there.

Messrs. Medway's Safety Lift Co., Ltd., have removed from Deptford to Victoria Works, Maidstone, where they have large works with up-to-date equipment. The company's selling organisation continues at 35, Surrey Street, London, W.C.

Catalogues and Lists.—Falk, Stadelmann & Co., Ltd., 83-87, Farringdon Road, E.C.1.—Catalogue 506, a bulky publication (188 pp.), containing illustrations and prices of electrical material and accessories of all kinds for lighting, telephones, radio work, &c.

Messrs. Vickers-Petters, Ltd., Ipswich.—A brochure containing illustrations of the firm's works and manufactures.

Constructors, Ltd., 4, Brook Street, St. Paul's, Birmingham.—Two illustrated booklets describing "Welconstruct" slotted-steel racks, bins, benches, shelving, &c.

The English Electric Co., Ltd., Queen's House, Kingsway, W.C.2.—Publication No. 453, containing illustrated details of medium-duty oil-break switches.

Enterprise Manufacturing Co., Ltd., Grape Street, Shaftesbury Avenue, W.C.2.—An illustrated net price list of fittings and appliances for electrical installations.

The Hightensite and Ebonite Manufacturing Co., Ltd., Normandy Works, Custom House, E.16.—A trade price list of ebonite sheeting, rod, and tubing, as well as manufactured articles.

Sterling Telephone and Electric Co., Ltd., 210-212, Tottenham Court Road, W.1.—Publications No. 371, dealing with "No. 1201," crystal radio receiving set; No. 376, describing the "No. 2" crystal set; and No. 379, advertising variable air condensers. Fully illustrated and priced. Twelve-page illustrated price list (No. 358) of "Sterling" and "Magnavox" loud speakers and low-frequency amplifiers.

The Siluminite Insulator Co., Ltd., The Green, Southall, Middlesex.—Two illustrated leaflets dealing respectively with "Siluminite" switchboard panels and "Arcovite" arc shields and cores for resistance coils.

Glasgow Electrical Engineering Co., Ltd., 45-47, Pitt Street, Glasgow.—An illustrated booklet giving details of small wind-power plant.

British Insulated & Helsby Cables, Ltd., Prescot, Lancs.—A well-illustrated list (pp. 179) of transmission line materials, including poles, brackets, clamps, insulators, &c. A large amount of technical information is contained in the publication.

The Midland Electric Power Installation Co., Old Mill Street, Wolverhampton.—A pamphlet illustrating an improved type of "Mepic" shop-window heater. Priced.

The Telephone Manufacturing Co., Ltd., Hollingsworth Works, West Dulwich, S.E.21.—A priced and illustrated catalogue of "True Music" radio-telephone sets, components, and accessories.

St. Helens Cable and Rubber Co., Ltd., Slough, Bucks.—A catalogue, with thumb index, giving particulars and prices of C.T.S. cables, flexible cords, &c., mining specialities, corrosion-proof fittings, and other products of the firm.

Superlamp, Ltd., 197, Old Street, E.C.2.—A net trade price list and four illustrated leaflets dealing with lighting fittings, and electrical accessories of various kinds.

The British Thomson-Houston Co., Ltd., 77, Upper Thames Street, London, E.C.4.—Priced pamphlet relating to the "Tungar" battery charger; illustrated descriptive price circular of the "Spotlight" projectors for theatre, shop-window, and other illumination.

The Chloride Electrical Storage Co., Ltd., Clifton Junction, near Manchester.—Illustrated and priced catalogue "P," dealing with portable Exide batteries and component parts, including the "HZ" type battery specially designed for use with "dull emitter" radio valves.

Engineering Supplies, Ltd., 155a, Upper Thames Street, London, E.C.4.—Price list (A 11023) of general lighting accessories.

Book Notices.—"Year Book and Diary of the Electrical Contractors' Association of Scotland" (52 pp. and diary). Glasgow: Hoxton & Walsh (1918), Ltd.—This issue of the year book is prefaced with a portrait and short biography of the president, Lt.-Col. A. B. Robertson, O.S.O., T.D. This is followed by lists of members and a short history of the Association, together with an article on the objects and scope of the organisation. Other interesting sections are tables showing the power required to drive various machines, a list of Scottish architects; a *résumé* of the Workmen's Compensation Acts, &c.; model conditions of tender; a list of on-cost charges to be met by contractors; and particulars of Scottish electricity undertakings.

"Alternating Current Bridge Methods," by B. Hague. Pp. xiii+302; 76 figs. London: Sir Isaac Pitman & Sons, Ltd. Price 15s. net.

"*Journal* of the American Institute of Electrical Engineers." Vol. XLII, No. 10, October, 1923. New York: The Institute. Price $1.

"Principles and Practice of Wireless Transmission," by G. Parr. Pp. 163; 21 figs. London: Benn Bros., Ltd. Price 5s. net.

"Working of Steam Boilers" (sixth edition, revised and enlarged), being instructions respecting the working, treatment, and attendance of steam boilers, by E. G. Hiller. Pp. 166; figs. 87. Manchester: Bethell & Co., Ltd. Price 3s. 6d.

"*Journal* of the Institution of Electrical Engineers." Index to Vols. 48 to 59, 1912-1921. London: E. & F. N. Spon, Ltd. Price 10s. 6d.

Japanese Reconstruction.—A *Central News* dispatch, dated Tokio, October 20th, states that the Mayor of Yokohama has submitted a plan for the restoration of the city involving an expenditure of over half a milliard yen. It is proposed to extend Yokohama Harbour from the northern breakwater to the mouth of the Tsurmi River. Representatives of leading American firms are organising an American merchants' association with a view to promoting trade throughout Japan, and co-operating with the Department of Commerce at Washington and the U.S. Chamber of Commerce.

We are informed that the Westinghouse Electric International Co. has received over $1,000,000 worth of orders for electrical apparatus to be used in reconstruction work in Japan, and other orders are in course of negotiation which will bring the total to double that amount. While power plants in the earthquake zone were not seriously damaged, much of the distribution work was practically destroyed.

Railway Charges.—The Mansion House Association on Railway and Canal Traffic, at its General Purposes and Executive Committee meetings, has decided to proceed as far as possible with the preparation of evidence in support of its objections.

New French Companies.—There has been formed at Montaigu (Vendée) the Société Nord Vendéen Electrique, with a capital of 1,500,000 fr., for the purchase, construction and working of generating stations and the distribution of current. The capital is 1,500,000 fr.

The Société d'Electricité de Bègles Bouscat et Extensions is the style of a company formed, with a capital of 1,000,000 fr., to work a concession in the townships of Bègles and Bouscat (Gironde) or elsewhere. Its offices are at 5, Avenue du Coq, Paris.

"Assembled" not "Made."—A Birmingham correspondent writes stating that during the last few weeks the market has been flooded with bayonet lampholders which, emanating from Birmingham, are offered to the electrical trade as "British made." It is true, says the writer, that the porcelain interiors and the plungers of these lampholders are British, and the goods are assembled in Birmingham, but the brass cases (which, of course, constitute the bulk of both labour and material) are made in Germany. In the interests of British industry, it is suggested that purchasers before ordering should obtain a declaration regarding the origin of the cases.

A Melbourne Strike.—According to a *Reuter* dispatch, a strike of electricians, mechanics, and property men is rendering difficult the production of plays in the Melbourne theatres. The strikers object to an arbitration award which makes their duties interchangeable.

A later dispatch says that the strike has been settled, the dispute having been submitted to arbitration.

Canadian Exhibition Train.—The Canadian industrial exhibition train, which has been touring France, is now in Belgium, and will visit Mons, Charleroi, Namur, Liége, Antwerp, Ghent, and Brussels before returning to Paris on October 29th.—*Evening News.*

Reduction of the B.B.C. Tariff.—The attention of our readers is directed to the announcement of the National Association of Radio Manufacturers appearing in our advertisement pages to-day. It relates to the reduction of the B.B.C. tariff and the credit that members of the Association are prepared to give to their trade customers if they lodge their applications by November 10th.

German Schemes for Electrical Control in Switzerland and South America.—The *Daily Mail*, on the 16th inst., published the following interesting communication from its own correspondent at Lausanne:—"The incursion of the Stinnes group into the industrial life of Switzerland has created great resentment. The Swiss Press is now asking where this policy of peaceful absorption by Germany will end. Since the establishment of a branch office at Zürich under the direction of Colonel Egli, many leading Swiss concerns have come under complete or partial control of the Stinnes group. The chief among these are the Swiss General Electricity Co., with which are affiliated such important organisations as the Electro Bank of Zürich, the Baden Electricity Co., and the Watt engineering firm in Glarus.

"By the absorption of the Electro Bank Stinnes obtains the controlling interests in the following important electrical combines:—The Swiss Central Electricity Co. of Lucerne; Laufenburg Electric Forces; the Electro-Chemical industrial works of Bodio; and the Watt Co. at Glarus. In addition, the bank is largely interested in similar enterprises in Venice, Naples, Madrid, Lisbon, Strasbourg, Constantinople, and Finland, and in the Paris Central Electric Power Co.

"By the fusion of the Baden Motor Co. with the Columbus Electrical works, Stinnes extended his influence to South America, where he is credited with the intention of obtaining complete control of the chief electrical enterprises. Recent overtures of the Stinnes group for the purchase of several leading Swiss-German newspapers have met with much opposition from the Swiss Press, which threatens to organise a boycott of the journals in question in the event of their passing under the control of Stinnes."

New Motor Factory.—Messrs. Higgs Brothers inform us that they have purchased 14 acres of land at Witton, Birmingham, and on Monday last began the erection of a new factory on the site, designed expressly for the economical manufacture of electric motors up to 50 h.p. It is hoped that the first portion will be completed in about 12 months, when the whole of their works will be transferred to the new factory.

The Boilermakers.—After a five hours' conference at York on Tuesday, the delegates of the Boiler Makers' Society adjourned the proceedings until the following day, no decision having been reached.

For Sale.—Messrs. Butcher & Co. will sell by auction on November 6th and following days, at 554, Oxford Street, W., a large quantity of electrical stores and accessories. Bristol Corporation electricity department invites offers for about 3,000 second-hand 1-W metal-filament conference lamps, 105 V and 230 V. (See our advertisement pages to-day.)

Applications for British Trade Marks.—The following are among the recent applications for Britsh trade marks. Objections to any of the proposed marks may be entered within one month from the dates mentioned:—

Nomag. No. 439,153. All goods in Class 8. No. 439,154. All goods in Class 13.—Ferranti, Ltd., Hollinwood, Lancashire. October 17th, 1923.

Galvanome. No. 440,487. Class 11. Electro-medical instruments, apparatus and contrivances for curative purposes.—The Cox-Cavendish Electrical Co., Ltd., 105, Great Portland Street, London, W. October 17th, 1923.

Gecofix. No. 439,154, 440,464. Class 13. Electric fittings made of metal.—The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C. October 17th, 1923.

New Polish Company.—Under the auspices of several banking and electrical concerns, a new company has just been formed in Brussels (158, Rue Royale), with a capital of 10,000,000 fr., and the title La Société d'Entreprises Electriques en Pologne, to establish and finance electrical undertakings in Poland.

Wireless Trade in Johannesburg.—There is remarkable activity in Johannesburg in the selling of wireless apparatus, and stocks of every kind are snapped up as soon as they are received. The report that broadcasting is shortly to be seriously undertaken probably accounts for this activity. The Customs duty on wireless apparatus has recently been removed and prices here of all kinds of electrical apparatus compare very favourably with overseas prices. Competition, however, is very keen and the wireless business is no longer confined to the dealers who hitherto specialised in it, but stocks are now carried by the big department stores, and even by chemists and cycle dealers.—*Reuter's Trade Service* (Johannesburg).

National Alliance of Employers and Employed.—At a general council meeting, held at Caxton Hall last week, under the chairmanship of Sir Edward Manville, M.P., reports were presented showing the success of the re-organisation scheme which was put into operation in February last. Mr. E. F. Leicester, under whose direction the scheme was carried out, was unanimously appointed general secretary. Considerable expansion work is in operation throughout the country and the number of students studying under the Alliance Industrial and Economic Education system is now approximately 3,000. Two of last year's students, taken from the workshops, have passed the University of London's Modified Matriculation examination and are now preparing for their B.Sc. Econ. degree under the Nottingham University. The National Alliance, by providing such facilities, has thus put into practical effect the idea, long mooted, for laying a definite road for workers from workshop to university.

British Engineers and the Economic Conference.—The Council of the British Engineers' Association last week approved a Memorandum on the Imperial Economic Conference in Relation to the Engineering Industry. Copies were sent to the President of the Board of Trade and to the Press. After expressing sympathy with the objects of the conference, the memorandum proceeds to consider the question of Empire development loans for securing the rapid achievement of these objects. "British Capital to nourish British Industries" is the principle urged and the Association's views on the subject of Imperial Preference are stated; finally the importance of British Engineering Industry to the Empire is concisely stated.

French Imports and Exports.—It is stated that the tonnage of the imports of electrical apparatus and machinery into France in the first eight months of the present year was less by nearly 1,000 tons than in the corresponding period of last year, although the value increased from 73,475,000 fr. in the term in question in 1922 to 89,199,000 fr. in the current year. On the other hand the exports in the same period show an augmentation of 435 tons over the equivalent months in 1922 and an increase of over 30,000,000 fr. in the value.

Employment in India.—In view of the unfortunate experience of a number of Englishmen who have recently worked their way out to India in search of employment and have been disappointed on their arrival, an official warning has been issued stating that it is highly undesirable for any Englishman to go out without first securing a definite post or having the prospect of pursuing a professional career.

Strike in Czecho-Slovakia.—A coalminers' strike, which has lasted over six weeks, is paralysing the industries of Czecho-Slovakia. Firms in many branches have been compelled either to wholly close down or work with a greatly reduced staff. The Chaudoir Metalworks of the Krizik Co., the Bergmannwerke in Bodenbach, glassworks, chemical factories, foundries, tramways, &c., are among those affected. Smaller local industries, dependent on local stations for their electric supply, are likewise suffering, the situation being the graver owing to the great majority of electricity stations being steam-driven. The only help appears to be the masterful intervention of the Government, of which at present there are no signs.

Dublin Electric Crane Men.—A curious feature of a dispute between the Irish Transport Workers' Union and two members of the union was the calling out of the operators of electric cranes and capstans at the port of Dublin, so that vessels were compelled to turn on winches and derricks for the discharge of cargoes. Power required for the movement of loaded waggons to the railway termini for despatch to the provinces being cut off, there was much delay and inconvenience in the removal of goods. The dispute arose because two crane men had failed to pay their ordinary subscriptions to their union. The union now insists that employers shall compel members to pay their subscriptions—a responsibility which the employers naturally do not wish to undertake.

Electric Furnaces.—Under the style of Russ Eletro-ofen, Köln, has been formed in Essen a company with 100,000 kr. capital, to develop the patent of the Russ electric furnace.

Turbine Construction in Russia.—The Petrograd Metal Works have resumed the construction of steam turbines. Five orders are now in hand, these including one turbine of 2,000 kW for the Omsk station, one of 3,000 kW for the Rostoff-on-Don station and two of 500 kW for Novo-Nikolaief, while the fifth will be of 1,250 kW for the Petrograd paper trust. A special turbine workshop has been provided and work on the machine for Omsk has already been begun.

Catalogues Wanted.—Messrs. Plant & Supplies, Ltd., of 12 and 13, Henrietta Street, London, W.C.2, wish to receive trade price lists of domestic electrical appliances.

Copper and Lead Prices.—Messrs. F. Smith & Co. report October 23rd:—Copper (electrolytic) bars, £64 10s., 10s. decrease; do. do. sheets, no change; do. do. wire rods, £74 10s., 10s. decrease; do. h.c. wire, 9½d., 1/16d. decrease; silicium bronze wire, 1s. 0¾d., ¼d. decrease.

Messrs. James & Shakespeare report October 24th:—No change in copper bars (best selected), sheet and rod; English pig lead, £30, 20s. increase.

LIGHTING AND POWER NOTES.

Australia.—Western Australia.—The earnings of the Government electricity supply undertaking for the year ended June 30th last amounted to £137,089, as compared with £92,312 in the preceding year. Working expenses rose from £87,582 to £99,718, leaving a gross profit of £37,351, as against £31,193. After deducting interest and depreciation charges there was a net surplus of £2,871, as compared with a deficit of £566 in the previous year. This is the first year in the history of the undertaking that a profit has been shown. The plant capacity has been increased to 19,500 kW by the addition of a 7,500-kW generating set. The amount of energy sold rose from 27,105,309 to 31,268,404 kWh, and the average price obtained remained at 1.05d.

Birkenhead.—Special Order.—Birkenhead Town Council is applying to the Electricity Commissioners for a Special Order to extend its area of electricity supply so as to include the urban district of Bebington and Bromborough.

Bolton.—"Hire-Purchase" System.—The Town Council has decided to let out electric cookers on hire-purchase and has authorised the purchase of 50 cookers as an experiment.

Bradford.—Mains Extensions.—The Electricity Committee has secured the approval of the Finance Advisory Committee to further expenditure on extensions of electricity mains, &c., up to a total of £20,000.

Canada.—Toronto.—The recently-published report of the Toronto Electric Commissioners for the year 1922 records a total income of $4,404,754, as compared with $3,622,605. Operating and management costs amounted to $1,198,840 and the cost of purchased energy to $1,854,269, as against $1,101,355 and $1,111,019 respectively in the preceding year. The gross surplus was thus $1,351,644. Interest, taxes, and other capital charges absorbed $1,119,602, leaving a net profit of $232,041. The amount of energy sold rose from 221,384,558 to 265,583,040 kWh, and the connected load from 227,600 to 265,398 h.p. During the year the Hydro-Electric Power Commission completed negotiations for the purchase of the local distribution plant of the Toronto and Niagara Power Co., and the transfer of this plant to the city of Toronto, to be operated by the Toronto Hydro-Electric System.

Cranbrook.—Electricity Supply.—The Electricity Commissioners have granted an Order to a company to supply electricity within the area of the Rural Council. The same company has applied for powers to supply electricity in the borough of Tenterden and in the area of the Tenterden Rural Council. The generating station is to be erected at Hartley, Cranbrook.

Continental.—France.—The Union d'Electricité is to extend its area of electricity supply to the departments of the Seine, Seine-et-Oise, Oise, and Seine-et-Marne. Eight underground and four overhead transmission lines are to be constructed, five of which will start from the power station at Gennevilliers, while the others will commence from stations of the Ouest Lumière and the Triphasé companies, which work under the former company.

Two schemes for the supply of electricity in the agricultural districts of the department of the Somme are announced. One, prepared by the Société d'Intérêt Collectif Agricole de la Région de Ponthieu, comprises 32 townships, and the other, promoted by the Société d'Intérêt Collectif Agricole de la Région de Péronne, embraces 42 townships. Official sanction is being applied for.

Earby (Yorks.).—Proposed Electricity Supply.—The Clerk to the Urban District Council has had an interview with the electrical engineer of the Colne Council, and has communicated with the Electricity Commissioners regarding a supply of electricity to the district. It was decided to obtain the opinion of a conference of West Riding local authorities as to the prospects of a supply being given to the Earby district and the most appropriate source of such a supply.

East Kent.—Special Order.—Colonel Woodall has applied to the Electricity Commissioners for a Special Order authorising him to supply electricity in the boroughs of Deal and Sandwich, the urban district of Walmer, the rural districts of Eastry and the Isle of Thanet, and in the parish of Ringwould, in the rural district of Dover.

Greenock.—Electricity in Bulk.—The Electricity Committee has before it a proposal to give a bulk supply of electricity to Dunoon. A report has been received from the electrical engineer, which states that the cost of carrying out the scheme would be £10,000, and that it could be undertaken only on a guarantee by the Dunoon Authority to pay £8 per kW, plus 2d. per kWh, with a minimum of 300 kW. The convener and vice-convener of the committee are to report on the matter. Applications have also been received for a bulk supply to Shelmorlie, Wemyss Bay, and Inverkip. The estimated cost of carrying out the work would be about equal to that of the Dunoon scheme, and it has been decided to meet the Skelmorlie Committee in connection with the matter.

Halifax.—Loans Sanctioned.—The Corporation has received the sanction of the Electricity Commissioners to the borrowing of £3,000 for building work and £21,500 for new plant.

Inauguration of New Plant.—Mrs. Thomas Hey, wife of the chairman of the Tramways and Electricity Committee, started up the new 10,000-kW turbo-alternator at the Corporation power station on October 18th. Another set is on order, and is expected to be in operation before the end of 1924. The set has been supplied by the British Thomson-Houston Co., and runs at 3,000 r.p.m. It generates three-phase current at 6,600 V, 50 cycles per second, and has an overload capacity of 25 per cent., with a maximum continuous output of 12,500 kW. The turbine is of the Curtis compound impulse type. The alternator is of the totally enclosed, air-cooled type. The condensing plant is the work of Messrs. Worthington-Simpson, of Newark, while two new cooling towers have been erected by the Premier Cooler and Engineering Co., of Shalford, near Guildford. Four cross type marine boilers, each with an evaporative capacity of 37,000 lb. of steam hourly, are under order from Messrs. Babcock and Wilcox, and two of these are already working.

Hawarden.—Special Order.—The Electricity Commissioners have made a Special Order authorising the Rural District Council to supply electricity in the parishes of East Saltney, Higher Kinnerton, Hope, Llanfynad, Sealand, and Tryddyn, and part of the parish of Hawarden.

Irish Free State.—Kingstown.—The Irish Free State Government has sanctioned the borrowing of £33,000 for work in connection with the electricity scheme for the district, and plans have been prepared by Messrs. J. P. Tierney and Co.

London.—Hammersmith.—The accounts for the year ended March 31st, 1923, of the electricity undertaking (engineer: Mr. G. G. Bell), show that the total income was £161,241, as compared with £182,717 in the previous year. The expenditure was reduced from £129,909 to £88,357, and the gross surplus was thus increased by over £20,000 to £72,884. The capital charges were only about £5,000 higher, making the net profit £30,081, as against £15,114 in 1921-22. Out of this profit a sum of £7,300 was contributed to rate relief, and a net amount of £7,563 was spent for capital purposes. The capital account shows that £161,815 was expended during the year. About £115,000 was spent on machinery, boiler plant, &c.; £22,811 on mains and services, and £17,640 on sub-station plant. The amount of energy sold increased from 15,262,130 to 16,255,200 kWh, while the maximum demand rose from 8,987 to 9,715 kW.

St. Pancras.—The Borough Council has received the sanction of the Electricity Commissioners to the borrowing of £1,935 for switchgear at the King's Road station, and is applying for sanction to borrow £20,683 for electricity purposes. The Electricity Committee has recommended the expenditure of £200 for the purchase of electrical cooking apparatus.

Battersea.—The Borough Council is applying to the Electricity Commissioners for sanction to the borrowing of £14,204 for mains, services, and machinery.

Plymouth.—New Plant.—The Corporation has received the approval of the Unemployment Grants Committee to the scheme for additional plant at the electricity works. The Committee has agreed to guarantee 50 per cent. of the interest on the loan of £90,429, the grant to be in operation for 15 years, provided the work is actively commenced by November 30th.

Mains Extensions.—The Electricity Committee is to extend the mains in various parts of the town at an estimated cost of £4,500.

Preston.—Year's Working.—The accounts of the municipal electricity undertaking (engineer: Mr. J. F. Simpson) for the year ended March 31st last record a total revenue of £74,707 and a working expenditure of £39,800, leaving a gross surplus of £34,907. After the payment of all capital charges, a net profit of £9,533 remained. The above figures are not comparable with those of the previous period owing to the

addition of the undertaking of the National Electric Supply Co., Ltd., to the Corporation's system, by purchase, during the year. The energy sold amounted to 4,305,091 kWh, and the maximum demand was 3,300 kW on a plant capacity of 5,570 kW.

Redcar.—Proposed Electricity Scheme.—In connection with the proposed scheme for an electricity supply for the town, the Town Council has applied to the Electricity Commissioners for sanction to the borrowing of £21,000 to carry out the work if the scheme is approved.

Rochdale.—Electricity Order.—The Town Council is applying to the Electricity Commissioners for an Order authorising it to give an electricity supply to Wardle.

Russia.—In the government of Yaroslavl considerable success has attended electrification work. There are electricity stations in all the towns of the Government with the exception of the town of Uglitch, where also an electricity station is in process of construction. The system of small village electrification now includes eleven stations, built mostly in 1919-20, and embraces a considerable part of the Danilovsk, Yaroslavsk and Rostoff districts. The district electricity station near Yaroslavl is being erected at "urgent" speed. It lies near the Lyapinsk peat marsh, and is calculated to supply a district of over 100 versts radius; its capacity is to be 10,000 kW, and the first set of the station will be inaugurated on May 1st, 1924.

Early in September the committee of the Moscow Electric Trust had under consideration the plans for the construction of a new hydro-electric station and high-pressure system for Tashkent, originally intended to have an equipment of 4,500 h.p., with an initial capacity of 300 h.p. and a pressure of 6,000 volts.

Sidmouth.—Electricity Charges.—In connection with the electricity scheme, the Urban District Council has decided to adopt the overhead system of supply, and the following charges have been fixed:—Lighting: 1s. per kWh. Heating and power: 1s. per kWh for the first 20 kWh per quarter, and 6d. per kWh beyond.

South Africa.—Victoria Falls Power Scheme.—The application of the Victoria Falls and Transvaal Power Co., Ltd., for authority to erect a new power station at Witbank, was recently reopened at Johannesburg. The scheme is estimated to cost £1,000,000. The board which is conducting the inquiry into the application consists of Sir Robert N. Kotze, Dr. W. A. Caldecott, and Mr. J. A. Vaughan. Mr. Stallard, counsel for the company, suggested that an amended licence should be granted to the Victoria Falls Power Co. to erect a station at Witbank, with transmission lines, and that if and when the South African railways desired to take power, and were in a position to do so, the Commission should then take over the whole station, and that meanwhile they should undertake the distribution in the Witbank area to other consumers, and that arrangements would be negotiated whereby the station would be run by the company, perhaps, on behalf of the Commission, pending the taking over of the whole of the station when the South African railways were ready for operation. The inquiry was adjourned.

Taunton.—New Plant.—The Town Council is applying to the Electricity Commissioners for sanction to the borrowing of £20,000 for the following purposes:—One 1,000-kW generating set, £12,000; doubling the size of battery, £1,200; two boilers, £4,400; new circulating water main, £1,500; contingencies, £900.

United States.—Hydro-Electric Development.—The Columbia Railway and Navigation Co. has applied for authority to erect the Santee-Cooper Canal power station at a cost of $8,217,000; the initial development plans provide for the installation of four generating sets with a total capacity of 42,800 h.p.; the ultimate capacity of the station will be 121,800 h.p.

The Tennessee Electric Power Co. announces that the next step in its development programme will include either additional plant at Hole's Bar, with a capacity of 27,000 h.p., or a third hydro-electric power station on Ocoee River.—*Reuter's Trade Service* (New York).

Venezuela.—Caracas.—The construction of a hydro-electric power station on the Caruao River is being undertaken by a Caracas syndicate to supply additional electricity to that city. It is estimated that 3,000 h.p. can be developed. The energy will be transmitted over a distance of 37 miles.—*Commerce Reports.*

TRAMWAY AND RAILWAY NOTES.

Australia.—Western Australia.—The report upon the Government tramways for the year ended June 30th last shows that the total earnings amounted to £262,689, as compared with £248,463. Working expenses amounted to £213,928, as against £204,459, giving an increase in gross profit from £39,359 to £48,761. After deducting capital charges there was a net profit of £8,342. The net result of the previous year's working was a profit of £3,835. The car-mileage increased from 2,644,725 to 2,770,518, and the number of passengers carried increased from 25,042,689 to 25,933,983.

Chile.—Railway Electrification.—According to the *Railway Gazette*, the general manager of the Transandine railway has applied to the Chilean Government for permission to erect a power station and utilise the River Juncal in connection with the proposed electrification of the Transandine railway.

Continental.—Russia.—It is officially stated that the Moscow municipality has prepared a draft for the construction of an underground railway in Moscow. The municipality, however, is unable to carry out the scheme without the co-operation of foreign capitalists, and in this connection negotiations have already been opened by the foreign trade representation of the Moscow Soviet, the Movneitorg.—*Reuter's Trade Service* (Berlin).

France.—Schemes for the electrification of various tramway lines in the Rhône department are under consideration by the Compagnie des Omnibus et Tramway de Lyon. The lines comprise that running from Lyon to Saint Priest; the Lyon to Neuville line, which is to be extended to Trévoux; and an extension of the Lyon to Trois Renards line to link up with Charbonières.

The first railless-car system in France was formally inaugurated on October 22nd between Modane and Lanslebourg, in French Savoy. The electrical energy is furnished from local waterfalls.—*Morning Post.*

Italy.—The Società Ferrovie Elettriche Brellesi has been formed with a capital of 6,000,000 lire to acquire and electrify the Biella-Balma and the Biella-Valle Mosso railway.

Poland.—A Polish-British company has been formed for the construction of electric railways in Poland. The first projects proposed are lines from Warsaw to Grodzisk and Zyrardow and from Warsaw to Zazki and Wolmomin. Later it is planned to construct a line from Warsaw to Nowoninsk and Otwock. The company has not yet been able to secure concessions from the Railway Ministry, which, it is reported, fears competition for its own steam lines.—*Commerce Reports.*

Edinburgh.—New Cars.—The Corporation has decided to proceed with the construction of eight tramcars at its own depôt with a view to relieving unemployment. It was originally intended to place the work with a Bristol firm.

Halifax.—Loans Sanctioned.—The Corporation has received the sanction of the Ministry of Transport to the borrowing of the necessary money for the reconstruction of the Hebden Bridge track, and the general manager of the tramway undertaking has been authorised to proceed with the work at once. Sanction has also been received to the borrowing of £2,700, repayable in 20 years, for the doubling of the tramway track between the Punch Bowl Inn and Blougheroft Lane, on the Boothtown route.

Huddersfield.—Penny Fares.—The Town Council has decide to re-introduce penny tramway fares on all routes from January 1st next, the existing minimum being 1½d. It is estimated that the change will be equivalent to a reduction in the revenue of between £25,000 and £30,000 per annum.

Irish Free State.—Cork.—The Corporation has adopted a resolution requesting the Cork Electric Tramways and Lighting Co. to extend the tramway system from St. Luke's to Dillon's Cross for the benefit of residents on the northern side of the town.

Ipswich.—Year's Working.—According to the daily Press, the Corporation reports a deficit of £3,000 for the year on its tramway undertaking.

Leeds.—Accident.—The need of a strict record of employés' war histories is emphasised by Lieut.-Col. A. H. L. Mount in his report to the Ministry of Transport on his inquiry into the Leeds tramcar accident on May 12th, which resulted in the death of seven passengers. Col. Mount's opinion is that as the result primarily of insufficient track-brake application Knight lost control, and in difficult circumstances failed to regain it. He had been gassed in the war, his left arm had been broken, and he had also suffered from nerves. Col. Mount also suggests that, in addition to keeping records of the men's war activities, there should be a special examination of cars. If the state of the ratchet of the car had been known, and had it been realised that one magnet was out of action, the car would presumably not have been passed as fit for the road.—*Leeds Mercury.*

London.—Underground Station Improvements.—Traffic facilities at Shepherd's Bush station, Central London line, are to be improved. The lifts will be superseded by two escalators, which are now in an advanced stage of construction. These escalators will be carried right to the platform level, thus obviating the necessity of traversing long corridors as at present. The present booking office will be demolished, and in its place Passimeter booking booths will be installed. The cost of carrying out the improvements will be £46,000, and it is anticipated that the whole of the work will be completed by the end of the year.

Railway Electrification.—L.M. & S.R.—The Rawtenstall (Lancs.) Employment Committee, with a view to finding work for the unemployed, has decided to ask the Minister of Labour to approach the L.M. & S. Railway Co. and urge it to put in hand this winter, if possible, a scheme for the electrification

of the Bury-Bacup railway line. The scheme, it is pointed out, would provide a more frequent and expeditious railway service between industrial districts with a combined population of 150,000. Schemes suggested in the Manchester area are the electrification of the Manchester to Oldham line and the Manchester to Buxton line, in addition to several smaller schemes.

Brighton Line.—The Brighton Town Council is determined to push forward the electrification of the Brighton section of the Southern Railway, which, it is claimed, will bring London within 40 minutes' journey of the town. A request for a deputation to be received from the Council has been refused by the Southern Railway Co. on the ground that the reorganisation of the system makes it impossible to consider the proposal.—*Evening News.*

Madeira.—New Electric Railway.—An electric railway is to be constructed in Madeira, linking the north and south parts of the island, the total length of the line being 70 miles.—*Reuter's Trade Service* (Madrid).

South Africa.—Natal Railway Electrification.—In connection with the electrification of the Natal railways, it is expected that the power station at Colenso will be brought into operation during May next year. Work is also proceeding at six sub-stations. Good progress has been made with the erection of the poles for the overhead lines, and an early start will be made on the wiring. Two of the 12,000-kW turbo-alternators are due for shipment from England before the end of the year.

TELEGRAPH & TELEPHONE NOTES.

Chile.—Telephone Extensions.—Mr. William Johnston, director-general in London of the Chile Telephone Co., Ltd., has sailed from Valparaiso for England, where he will report to the directors and shareholders on the concessions he has obtained to install longer-distance lines in various parts of the country. It is stated that the primary object of his return to London is to secure the necessary capital to ensure the working of the telephone concessions he has obtained from the Government, which are as follows: Reconstruction of the Santiago telephone plant by the installation of an automatic service, similar to that operating in Valparaiso. New trunk lines between Santiago and Valparaiso, Santiago and Talca, Santiago and San Antonio, and Santiago and San Felipe and Los Andes. Extension of the Valparaiso automatic service to Vina del Mar. New plant for Concepción, Iquique, Antofagasta, and Talco. New plant in La Serena, Chillan, and Temuco, with underground installations, and new trunk lines between Concepción and Cautin.—*Reuter's Trade Service* (Valparaiso)

Germany.—Radio Traffic.—The name of the Berlin Wireless Oversea Communications Co. has been changed to that of the Transradio Co. for Wireless Oversea Communications. At the recent meeting, when a decision to this effect was reached, it was stated that the course of business corresponded to expectations. The chief object for the present was radio traffic with North America, although good prospects existed for the new company in connection with the traffic with South America, where the station at Buenos Ayres was already experimentally in operation. The construction of the station at Rio de Janeiro was progressing.

India.—Proposed High-power Radio Station.—A radio telegraph company, formed for the purpose of erecting a high-power station in India, has been registered under the name of the Indian Radio Telegraph Co., Ltd. The capital of the company is three crores of rupees and the directors include Sir Purshotandas Thakurdas and Sir Ibrahim Rahimtoola.—*Reuter.*

Italy.—Atlantic Cables.—The Italian Submarine Cable Co., which holds a concession for the laying of cables between Italy and America, has informed the Italian Government that, although the company has raised the share capital of 200,000,000 lire, it cannot yet proceed with the laying of the cable between Italy and the Azores because the Portuguese Government has not yet granted landing rights. In order to hasten the establishment of the cable it is necessary for the company to obtain a concession for the latter purpose as soon as possible, and the company counts upon the intervention of the Government. The Rome correspondent of the *Journee Industrielle* asserts that the Portuguese Government is under the influence of the Eastern Telegraph Co., which is supported by the English Government, the English company apprehending that the projected Italian cable would cause a diminution in its traffic. It is added that the Italian company, in agreement with the Western Union Co., is now studying another route—Fiumicino-Malaga-Cadiz, or rather Fiumicino-Malaga-the Canaries, but a new law would be necessary to authorise this alteration in the route.

Japan.—Telegraph Codes.—The Department of Overseas Trade is informed that the restriction in Japan on the use of telegraph codes has been withdrawn in areas not under martial law.

Radio-Telegraphy at Sea.—International Conference.—A meeting of the Wireless Telegraph Committee of the International Shipping Conference was held on the 12th inst. in London. It was attended by representatives of the following countries: Australia, Belgium, Canada, Denmark, France, Germany, Great Britain, Holland, Japan, Norway, Spain and Sweden. The committee discussed questions affecting the carriage of wireless telegraph sets as a life-saver on board ship. The committee unanimously passed a resolution in the following terms:—

It is desirable that the Maritime States should take steps to convene an International Conference for the consideration of wireless problems, and pending the proposed conference all Maritime States are urged not to apply to foreign vessels regulations more onerous than those imposed by the Convention of 1914.

In the meantime the Governments of the Maritime States should be invited to give the closest study to the problem of perfecting an automatic alarm device within the next six months.

In a protocol accompanying the resolution it is pointed out that:—

(1) The committee adheres to its finding of May 24th, 1922, that the basis provided in the Convention of number of persons on board is logical and satisfactory.

(2) It reaffirms its opinion that International Conventions are rendered valueless by the application of national legislation at variance with the Convention to the vessels of the contracting parties.

(3) A number of nations have departed from the Convention with the result that the maritime countries are now more or less evenly divided between those which adhere to the Convention basis and those which have adopted a tonnage basis.

Russia.—Finland-Russia Telephone Service.—The Finnish Telegraph Board has reported in favour of the Russian proposal to establish a direct telephone service between Helsingfors, Petrograd, and Moscow.—*Reuter.*

The Telephone Service.—New Exchanges.—On October 20th a new telephone exchange was opened at Ellesmere Port (Cheshire) to supersede the existing exchange. At the same time new junction lines between South-West Lancashire and Ellesmere Port were brought into service.

A new exchange was opened at Southall on the same date, when 250 subscribers' lines were transferred from Ealing to the new exchange.

Hull Automatic Exchange.—At the opening of the new automatic telephone exchange at Hull, the Lord Mayor of Hull said the municipal telephone service saved the subscribers £15,000 a year, as compared with the Government system.—*The Times.*

Progress in Manchester.—The report by Mr. W. J. Medlyn, M.I.E.E., superintending engineer, Manchester Post Office Engineering Department, on telephone progress in the Manchester and South-East Lancashire district, shows that the number of telephones rose from 32,946 in 1912 to 56,645 in 1923, an increase of 23,699, or 72 per cent. in eleven years; 7,802 telephones were provided during the year ending September 30th, 1923, with a net increase of 4,665 for the year, which is a substantial improvement on the results obtained during the "boom" period of 1919-20. During the past 11 years the toal underground mileage has risen from 75,476 to 182,148, an increase of 141 per cent. A considerable network of underground telegraph and telephone cables already connects Manchester with other important industrial centres, and further extensions of the system are being made. Work on the new cable to Birmingham is well advanced and the section of this cable between Manchester and Macclesfield has recently been brought into use. An additional cable is also being laid to improve the service between Manchester, Disley, New Mills, Whaley Bridge and Buxton. The provision of an additional cable containing 160 lines between Manchester and Liverpool is well advanced. An underground cable is being extended from Oldham to Leeds to improve the service between Manchester and the Yorkshire centres. A new cable from Manchester to Glossop is nearly completed and the extension of the pipe track from Eccles to Atherton and Leigh is approaching completion. The laying of six additional pipes between Manchester and Stockport has recently been completed. A new pipe track has been completed for extending the Manchester-Warrington cable to Northwich. A scheme for laying direct underground cables between Manchester, Wigan, Ormskirk, and Southport is included in next year's programme.

In addition to main-line communication, many large extensions of the underground system serving local telephone subscribers have been effected, and the work is still steadily progressing. Concurrently overhead wires are being recovered, and during the past eleven years 13,066 miles of open wire in the district have been cut down. In the concentrated business areas in the city the overhead system of wire distribution is being entirely displaced by underground lines.

The Post Office proposals for the coming winter provide for the laying of additional trunk telephone cables in various parts of the country at a cost of over £500,000. South-East Lancashire's share of this scheme comprises the laying of new underground work from Manchester to Gatley, Wilmslow and Alderley Edge and from Manchester to Altrincham and Knutsford.

RADIO NOTES.

An Accumulator Service.—A scheme of supplying owners of valve-type radio receiving sets with a regular service of charged accumulators has been introduced by the British Battery Supply Service, of Carr Street, London, E.14. The service is undertaken at a charge of 12s. per quarter, the batteries remaining the property of the supply company.

Germany.—Broadcasting.—The German Ministry of Posts is to inaugurate a broadcasting service from the Koenigs-Wusterhausen station this month.—*Evening News.*

Irish Free State.—Irish Radio Association.—A radio association has been established in Dublin, with Professor W. J. Lyons, Municipal Technical Institute, as president. At a preliminary general meeting various interests—business, radio, national, army, post office and university—were represented. Professor Lyons said he hoped they in Ireland would be able to manufacture their own radio sets. Mr. Hancock (chairman of the Irish (Dublin) Centre of the Institution of Electrical Engineers, said that radio meant the opening of a new and wide field in that country. He feared there would be no protection for wireless apparatus manufactured in the Free State. Mr. Bridle (secretary of the Dublin Wireless Club) urged that there was only room for one association of this kind in Ireland. The following were elected vice-presidents: Prof. J. J. Dowling, National University; Prof. Thraft, Dublin University; Prof. Hackett, College of Science; Prof. Dillon, University College, Galway; Messrs. G. Marshall-Harriss, general manager Dublin United (Electric) Tramways Co.; W. J. Horgan and W. T. Hempenstall.

Italy.—Concession.—An Italian offshoot of the French Compagnie Générale de Télégraphie sans Fil has just secured from the Italian Government a concession which embraces the public radio service for the whole of Italy. The new company, styled Radio Italia, has a capital of 1,000,000 lire, which is about to be raised to 50,000,000 lire. The Italian Government will hand over all existing stations to the Radio Italia, which will add new stations where needful and generally develop the public radio service. A share of the profits earned will accrue to the Government.

Radio Society of Great Britain.—Competition.—A competition for amateur apparatus will be held under the auspices of the above-named Society during the forthcoming All-British Wireless Exhibition and Convention. Prizes for the best examples of amateur work are offered and members of any affiliated society are invited to compete in the competition.

Transmitter Section.—In consequence of the British Relay League having been merged in the Radio Society of Great Britain the latter organisation has formed a new Transmitter and Relay Section to promote intercommunication between experimenters, join hands with similar organisations overseas, investigate the quality of transmission, and to establish a collection of wavemeters and other useful apparatus for loan within the Section. All persons holding experimental licences are eligible for election to the Section.

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the* Electrical Review *in which the "Official Notice" appeared in our advertisement pages.)

OPEN.

Australia.—Sydney.—December 12th. New South Wales Government Railways and Tramways. Rotary converter sets.*

November 21st. 1,000-kW sub-station units.*

December 5th. Transformers.*

December 19th. Sub-station transformers.*

Sydney.—January 7th. City Council. Coal unloading and conveying plant.

January 14th. 33,000-V step-up transformer.

Melbourne.—January 3rd. Victorian Electricity Commissioners. Aluminium steel-cored cable and accessories. (October 12th.)

December 15th. Four 1,000-kVA single-phase transformers and spares. (October 12th.)

January 19th. Sub-station transformers, switchgear, and accessories. (See this issue.)

Belgium.—November 5th. Municipal authorities of Vierves (Province of Namur). Establishment of an electricity supply system in the town.

Dingwall.—October 31st. Town Council. Electric lighting work, slaughterhouse. J. & W. S. Dewar, town clerks.

Dover.—November 12th. Electricity Department. About 8 miles e.h.p. 3-core paper-insulated cables. (October 12th.)

Dublin.—Electricity and Public Lighting Committee. Repairs to batteries of accumulators, or, alternatively, for installation of a new battery at Pigeon House works. City Electrical Engineer, Fleet Street, Dublin.

November 12th. Great Northern Railway (Ireland). Stores, including electrical fittings, lamps, cable and wire, &c., for six months. (See this issue.)

Glasgow.—October 29th. Parish Council and District Board of Control. Stores, including electrical fittings and lamps, for the various hospitals for six months. Forms, &c., from Inspector and Clerk, 266, George Street.

Hastings. — Electricity Department. Water-softening plant. (See this issue.)

Liverpool.—November 12th. C. & A. Modes, Ltd. Installation of electric lighting at new premises in Church Street and Church and School Lanes. (October 19th.)

London.—Battersea.—November 1st. Electricity Department. Six e.h.p. feeder cubicles. (October 19th.)

Lambeth, S.E.—November 1st. Borough Council. Installation of electric lighting at the Coroner's Court and Mortuary, High Street, Lambeth. (October 19th.)

New Zealand.—Wellington.—Public Works Department. November 20th. Portable testing instruments for Mangahao power plant.*

December 4th. Metering equipment.*

December 11th. Transformers for the Waikato power scheme. Outdoor- and indoor-type apparatus for the sub-station at Penrose, Auckland.*

Auckland. — November 24th. Electric Power Board. Transformers and accessories.

Slaithwaite.—Wiring for electric lighting of Carr Lane United Methodist Church and School. Particulars from J. Berry & Sons, architects and surveyors, 3, Market Place, Huddersfield.

South Africa.—Johannesburg.—Municipal Council November 1st. H.p. cubicles.*

November 19th. Transformers.*

November 19th. Electric cables.*

Cape Town.—November 29th. City Council. Transformers.*

Taunton. — November 16th. Electricity Department. One 1,000-kW steam turbine geared to a 1,000-kVA single-phase alternator, with exciter, and a 250-kW d.c. generator, complete with condensing plant, &c. (October 19th.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

CLOSED.

Australia.—Melbourne.—Electric Supply Committee. Accepted:—

Insulated copper cables (£7,216).—W. T. Henley's Telegraph Works Co., Ltd.—*Tenders.*

Belfast.—Corporation Electricity Department.

Temperature-measuring equipment for eight boilers, including eight 6-point thermo-electric indicating outfits for measuring temperatures of the steam, of the inlet economiser gases, and of the stack; an 18-point electrical distance thermometer outfit for water temperatures, and a totally-enclosed indicating outfit for turbine steam temperatures.—The Cambridge & Paul Instrument Co., Ltd.

Belgium.—The Société des Ateliers de Constructions Electriques, of Charleroi, has just secured a contract from the Belgian State Railway authorities in Brussels for the supply and laying of a quantity of armoured cables required in connection with the State system of electric railways in the Antwerp district.

Three concerns, including a British one—Clarke, Chapman and Co., Ltd., of Gateshead-on-Tyne—submitted tenders last week to the Belgian State Railway authorities in Brussels for the supply of two electrically-operated capstans. The lowest offer was that of the Société d'Electricité et Electro-Mecanique, of Brussels.

Bradford.—Tramways Committee.

15 tons Peckham hand-brake shoes (£165).—National Rail and Tramway Appliances Co., Ltd.

40 tons track-brake shoes (£400).—Cole, Marchent & Morley, Ltd., Bradford.

Canada.—Messrs. Vickers, Ltd. (Hydro-Electric Department) has received from the City of Winnipeg, Canada, an order for turbines for extension to the power station at Point du Bois on the Winnipeg River. They are to be of much larger capacity than the turbines already installed. Three units have been ordered, each of 7,300 h.p., the head being 45 ft. It is interesting to record that over 750 tons of water turbines have been shipped to India and New Zealand from Messrs. Vickers's shops since June of this year.

Dublin.—Electricity Committee. Transformers for 12 months.

Tenders were received from:—British Electrical Transformer Co., Ltd.; Ferranti, Ltd.; A.E.G.; Justus Eck; Oerlikon, Ltd.; Brush Electrical Engineering Co., Ltd.; and the Metropolitan-Vickers Electrical Co., Ltd. The Committee recommends the acceptance of the tender of the British Electrical Transformer Co., Ltd., at the following prices:—300 kVA, £287; 250 kVA, £252; 200 kVA, £204; 100 kVA, £172; 50 kVA, £83; 100 kVA, 3-phase, £170; 50 kVA, 3-phase, £116 (air), £97 (oil); 100 kVA, 5,000/100 V, £127; 200 kVA, 3-phase, £217.

Two oil coolers:—

General Electric Co., Ltd.	£255
Oerlikon, Ltd.	156
Serck Radiators, Ltd. (Recommended.)	**153**
Caird & Rayner	100
Royles	68

—Irish Builder and Engineer.

Ferryhill (Co. Durham).

Electric lighting installation in connection with the housing scheme at Thrislington village, for the North Bitchburn Coal Co.—Devereux, Moodie & Co., Durham.

France.—Paris.

Contract for the valves for the high-pressure steam- and feed-water pipe ranges at the Vitry power station, Paris; contract for boiler mountings previously secured.—Messrs. Dewrance & Co.

Orders for the valves for the extension at Gennevilliers power station also placed with Messrs. Dewrance & Co.

Glasgow.—Tramways Committee. Recommended:—

Commutators.—Dyer & Young.
D.c.c. wire.—British Insulated & Helsby Cables, Ltd.
Isolating switches for Pinkston.—Metropolitan-Vickers Electrical Co., Ltd.

Government Contracts.—The following Government contracts were placed during the month of September:—

Admiralty Contract and Purchase Department.

Charging boards.—General Electric Co., Ltd.
Electrically-driven crane.—Brown Bros. & Co., Ltd.
Cells.—Premier Accumulator Co. (1921), Ltd.
Electric heating elements.—Credenda Conduits Co., Ltd.
Electrodes.—Quasi-Arc Co., Ltd.
Insulated fittings.—Micanite and Insulators Co., Ltd.
Motor generators and switchgear.—Newton Bros. (Derby), Ltd.
Electric trucks and cars.—British Electric Vehicles, Ltd.
Electrically-driven winches.—Brown Bros. & Co., Ltd.

Air Ministry.

Accumulators.—Chloride Electrical Storage Co., Ltd.
Delco ignition system spare.—Delco Remy, Ltd.
Internal wiring.—Simplex Conduits, Ltd.
Rotary transformers.—Small Electric Motors, Ltd.

War Office.

Spares for generating sets.—A.B.C. Motors, Ltd.
Electric lighting installation (Victoria Barracks, Windsor).—Electrical Installations, Ltd.

Post Office.

Telephone apparatus.—Automatic Telephone Manufacturing Co., Ltd.; British L. M. Ericsson Manufacturing Co., Ltd.; General Electric Co., Ltd. (Peel-Conner Telephone Works); Siemens Bros. & Co., Ltd.; Western Electric Co., Ltd.

Testing, protective apparatus.—Phœnix Telephone and Electric Works, Ltd.

Telegraph and telephone cable.—Enfield Cable Works, Ltd.; General Electric Co., Ltd. (Peel-Conner Telephone Works); Hackbridge Cable Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson and Phillips, Ltd.; Macintosh Cable Co., Ltd.; Pirelli-General Cable Works, Ltd.; Union Cable Co., Ltd.; Western Electric Co., Ltd.

Joint-box castings.—United Steel Companies, Ltd. (T. Butlin & Co. Branch); J. Varley, Ltd.

Secondary cells.—London Battery and Cable Co., Ltd.

Loading coils.—Western Electric Co., Ltd.

Telephone cords.—British Insulated and Helsby Cables, Ltd.; London Electric Wire Co. and Smiths, Ltd.; Phœnix Telephone and Electric Works, Ltd.; Siemens Bros. & Co., Ltd.

Ducts.—Hepworth Iron Co., Ltd.; J. Oakes & Co.; Standard Brick and Terra Cotta Co., Ltd.

Fibre ducts.—Key Engineering Co., Ltd.

Electric lamps.—British Insulated and Helsby Cables, Ltd.; British Thomson-Houston Co., Ltd.; Edison Swan Electric Co., Ltd.; General Electric Co., Ltd.; Metropolitan-Vickers Electrical Co., Ltd.; Siemens and English Electric Lamp Supplies, Ltd.

Cable distribution plugs.—British Insulated & Helsby Cables, Ltd.

Bronze wire.—T. Bolton & Sons, Ltd.; British Insulated and Helsby Cables, Ltd.; R. Johnson & Nephew, Ltd.; Shropshire Iron Co., Ltd.; F. Smith & Co. (incorporated in the London Electric Wire Co. and Smiths, Ltd.).

Copper wire.—T. Bolton & Sons, Ltd.; British Insulated and Helsby Cables, Ltd.; Electro Metals Co.; Elliotts Metal Co., Ltd.; Enfield Cable Works, Ltd.; Johnson, Clapham & Morris, Ltd.; R. Johnson and Nephew, Ltd.; Shropshire Iron Co., Ltd.; F. Smith & Co. (incorporated in the London Electric Wire Co. and Smiths, Ltd.); Wilkes & Son and Mapplebeck, Ltd.

Flameproof wire.—Macintosh Cable Co., Ltd.

Manufacture, supply, drawing-in and jointing cable.—Wakefield-Barnsley-Sheffield: W. T. Henley's Telegraph Works Co., Ltd.

Submarine cable.—Anglo-Dutch; Siemens Bros. & Co., Ltd.

Telephone exchange equipment.—Maidenhead: Automatic Telephone Manufacturing Co., Ltd. (Sub-contractors for batteries: Chloride Electrical Storage Co., Ltd.; for ringing machines: Crompton & Co., Ltd.). Paignton, Torquay: Automatic Telephone Manufacturing Co., Ltd. (Sub-contractors for batteries: Chloride Electrical Storage Co., Ltd.); for charging machines: Newton Bros. (Derby), Ltd.; for ringing machines: Crompton & Co., Ltd.; Harvey, Nicholls & Co. Weston-super-Mare: Automatic Telephone Manufacturing Co., Ltd. (Sub-contractors for batteries: Tudor Accumulator Co., Ltd.; G. H. Lee and Co.; Relay Automatic Telephone Co., Ltd.). Enfield: General Electric Co., Ltd. (Sub-contractors for batteries: Chloride Electrical Storage Co., Ltd.; for motor generator: Crompton & Co., Ltd.). Mill Hill: Western Electric Co., Ltd. (Sub-contractors for batteries: Chloride Electrical Storage Co., Ltd.; for charging machine: Crompton & Co., Ltd. Woolwich: Siemens Bros. & Co., Ltd. (Sub-contractors for batteries: Chloride Electrical Storage Co., Ltd.; for ringing machines, Crompton & Co., Ltd.; for charging machines, English Electric Co., Ltd.).

H.M. Office of Works.

Lift (Houses of Parliament).—Marryat & Scott, Ltd.

Crown Agents for the Colonies.

Electrical equipment.—J. Stone & Co., Ltd.
Table telephones.—British L. M. Ericsson Manufacturing Co., Ltd.
Telephone cable.—W. T. Henley's Telegraph Works Co., Ltd.
H.d. copper wire.—Shropshire Iron Co., Ltd.

London.—St. Pancras.—Electricity and Public Lighting Committee. 5,000-kV steam turbine, with 3-phase alternator and condensing plant, &c., required at the King's Road station. Fourteen tenders were received:—

	Rated kW.	£	Cost per kW. £ s. d.	Average Steam.
Oerlikon	5,000, plus 40 per cent. for 3 hours.	17,335	3 9 2	11.37
Brown, Boveri ...	5,000, plus 25 per cent. for 2 hours.	17,510	3 10 0	11.93
Escher, Wyss ...	Do.	19,644	3 18 9	12.26
P. Brotherhood ...	5,000, plus 25 per cent. for 2 hours.	21,544	4 6 0	11.88
Richardsons, Westgarth and Co.	Do.	21,910	4 7 3	11.86
Belliss & Morcom ...	Do.	21,954	4 7 9	12.02
English Electric Co.	Do.	22,046	4 8 2	12.81
D. Adamson ...	Do.	22,215	4 8 9	12.01
Howden & Co. ...	Do.	24,569	4 18 2	12.09
British Thomson-Houston Co., Ltd.	7,000 continuous rating.	25,384	3 12 7	12.09
Fraser & Chalmers	Do.	25,550	3 13 0	11.965
Metropolitan-Vickers Electl. Co., Ltd.	Do.	26,637	3 16 0	11.95
Brush Electrical Engineering Co., Ltd. (Recommended.)	**Do.**	**26,580**	**3 15 9**	**11.75**
Parsons & Co. ...	6,000, plus 25 per cent. for 2 hours.	26,791	4 9 2	11.772

The Borough Electrical Engineer, in his report, says:—The tender of Oerlikon Ltd., for £17,335 is a good proposition, and is the only foreign offer giving the specified 40 per cent. overload for three hours, but some alterations to the building would be necessary, and an expenditure of approximately £1,300 would need to be added to the contract to cover omissions and to secure a condenser of an equivalent area to that offered in some English quotations.

After carefully looking over the English offers, the choice lies between Messrs. Parsons & Co. and the Brush Electrical Engineering Co., Ltd. With regard to the plant offered by the Brush Co., the published figures for a similar set and bearing the signatures of the engineer and manager and the consulting engineer, show that on an average load of 5,030 kW at the Birchill's generating station, Walsall, the steam consumption was as low as 10.36 lb. per kilowatt measured. Reduced to similar conditions pertaining in St. Pancras generating station, this would represent a steam consumption of 11.2 lb. per kilowatt; the average figure given by the contractors is 11.75 lb. per kilowatt, proving pretty conclusively that a better steam consumption than that guaranteed can be expected.

After full consideration, I recommend the Committee to accept the tender of the Brush Electrical Engineering Co., Ltd., for a 5/7,000-kW set at a cost of £26,580.

The Electricity Committee states that in view of existing conditions in this country, it has not thought it advisable to consider the tenders received from foreign firms, and, acting on the advice of the Chief Electrical Engineer, it recommends the acceptance of the tender of the Brush Electrical Engineering Co. at £26,580.

Metropolitan Asylums Board.—The following tenders were received for the installation of electric light at East Cliff House, Princess Mary's Hospital for Children:—

J. H. Piggott	£158
Guild Housing, Ltd.	164
G. Sparrow & Co.	171
A. S. Palmer	200
A. Higginbotham & Sons	215
G. E. Taylor & Co.	226
A. Dean & Co., Ltd.	235
Toy & Winslow	235
W. J. Cannon & Co.	240
Margate District Electrical Co., Ltd.	245
Philpot & Sons	247
H. A. Neale & Co.	257
E. Wolf & Co.	264
C. F. Powell & Co.	270
D. Henderson	280
Edmundson's Electricity Corporation, Ltd.	286
Symper & Evershed	289
Stribling & Setterfield	291
Building Equipment Co., Ltd.	324
W. J. Ayling	385
Kent Coast Electrical Co.	400
Farndon's Power and General Electrical Co., Ltd.	460

H.M. Office of Works.

Nine months' supply of Siemens electric lamps, vacuum and gas-filled types.—Siemens and English Electric Lamp Co., Ltd.

Southend-on-Sea.—Town Council. Accepted:—

1,200-b.h.p. engine to be utilised as spare at the electricity works (£750).—Britannia Lathe and Oil Engine Co.

Sweden.—The Swedish State Railway Administration has received tenders from the Allmanna Svenska Elektriska A.B., the German A.E.G., the Siemens-Schuckert Co., Luth and Rosens Electrical Co., and the Eck Electrical Co. for the supply and erection of the equipment of five transformer stations in connection with the electrification of the railway between Stockholm and Gothenburg. The contract, which comprises the delivery of motors, generators, and transformers, auto starter transformers and instruments, and the work of erection, has been placed with the Allmanna Even-ska Co. at the price of 2,574,250 kronen. The lowest offer was submitted by the Siemens-Schuckert Co., the next lowest was made by the successful company, whose tender was not more than 8 per cent. higher than that of the German firm. It should added that a preference of 8 per cent. is usually given to Swedish firms in the case of the allocation of Government contracts.

THE HACKNEY ELECTRICITY UNDERTAKING.

INAUGURATION OF NEW PLANT.

The electricity undertaking of the Metropolitan Borough of Hackney, which commenced operations in October, 1901, now generates a.c. and some d.c., the former being 3-phase, 50-cycle, at 6,600 volts, and the latter 3-wire at 485 volts. In addition to the use of both coal and oil fuel, steam is raised by the destruction of refuse. The total cost of operation during the year ended March 31st last was 0.87d. per kWh sold, a decrease of 0.27d. as compared with the previous twelve months. A feature of the plant is its high thermal efficiency, 15.4 per cent., or 2.05 lb. of fuel per kWh, the undertaking occupying first place in this respect amongst stations of its own class and fifth amongst all stations in Great Britain. It should be pointed out, however, that the Hackney works are interconnected with those of the North Metropolitan Electric Power Supply Co. and of Poplar and Shoreditch; therefore, week-end and other light-load losses are reducible by shutting down some plant and relying on purchased bulk supplies, energy in bulk being at the same time sold to Poplar and Shoreditch.

The efforts of Mr. L. L. Robinson, borough electrical engineer, and his staff in popularising the use of electricity for all purposes are well known; as a result thereof, further extensions became necessary, and were officially inaugurated yesterday. The new plant includes a Parsons turbine, fig. 1, of 10,000 kW maximum continuous rating; it is designed for a steam pressure of 300 lb. per sq. in., but the stop valve is balanced to operate at 200 lb. until the next boiler house is ready to provide 350 lb. pressure. It runs at a speed of 3,000 r.p.m., and is provided with Hick, Hargreaves condensing plant, the auxiliaries being driven by d.c. 500-volt motors controlled by Brookhirst switchgear. The alternator is a 3-phase, 50-cycle, 6,600-volt machine cooled by means of a Sirocco fan, which is driven by a 30-b.h.p. d.c. 500-volt motor at a speed of 665 r.p.m., the air being cleaned in a Heenan & Froude wet filter.

The switchgear installed to control the new machine and feeders, &c., is shown in fig. 3, while fig. 4 is a view of the 10-panel switchboard; all this apparatus is of the standard e.h.p. type supplied by Messrs. A. Reyrolle and Co., Ltd. The older switchgear is of Messrs. Ferranti's cubicle type.

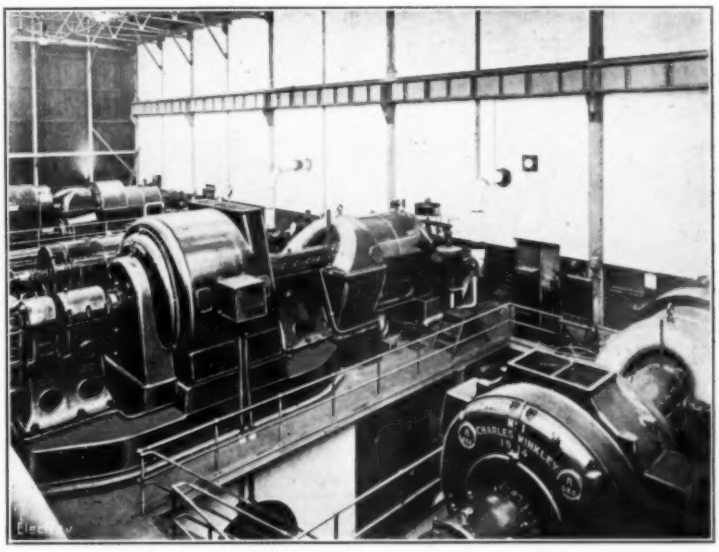


Fig. 2.—General View of Turbine Room.

Condensing water is obtained from the River Lea through a Brackett screen, driven through gearing by a 6-h.p. Lo-Thermo motor, made by Messrs. Electromotors, Ltd., which also drives a small pump that supplies the water for cleaning the screen, and stands in the open air.

The present arrangements will provide water for 20,000 kW of plant, but by moving the intake higher up the river, sufficient water can be obtained for 50,000 kW without the use of cooling towers.

Two new condensing water pumps, fig. 5, were supplied by the Rees Roturbo Manufacturing Co., Ltd.; each is driven by a vertical-spindle 200-b.h.p., 500-volt, d.c. motor at 475 r.p.m. The four older sets are each driven by a vertical Laurence, Scott 52-b.h.p., 530/660 r.p.m. motor.

The four new boilers are of Messrs. Babcock and Wilcox's standard type, each having a normal rating of 33,000 lb. per hour, with double chain grates fed from

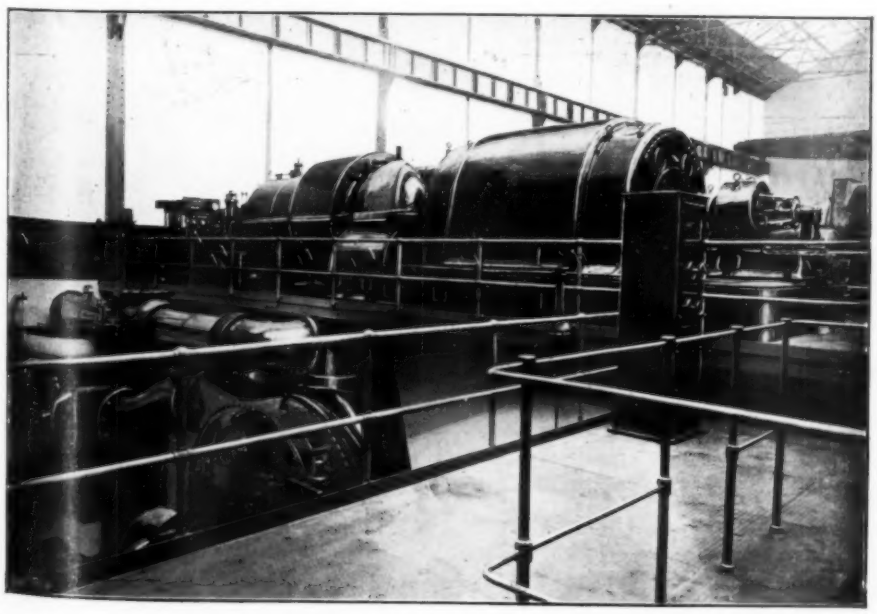


Fig. 1.—Parsons 10,000-kW Turbo-Alternator.

overhead coal bunkers; each of the travelling shoots has a coal-weighing machine and is capable of taking coal from any bunker. In addition, the old boiler house contains two coal-fired and six oil-fired B. & W. boilers and three Meldrum refuse destructors with Goodman coverings. Green economisers are used, with Weir and Hall feed pumps and Davidson induced-draught fans.

The duplicate coal-handling plant was supplied by Messrs. J. W. Jenkins, and has been in use for some years. It consists of an electrically-operated grab and

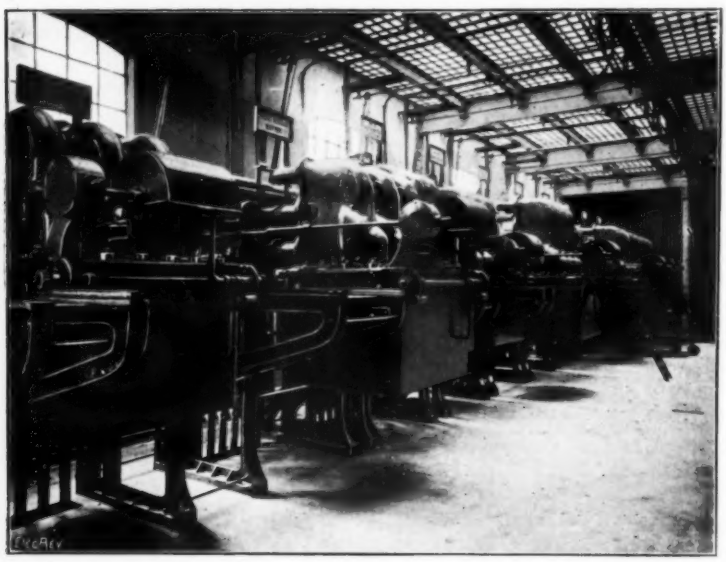


Fig. 3.—Reyrolle 6,600-volt Switchgear.

telpher, which unloads the coal barges and transports the fuel direct into the overhead coal bunkers. The ashes are collected from under the boilers in small trucks and tipped into a pit, where they are water cooled before being loaded into barges. The ashes are tested each day and are sold for making concrete blocks, being guaranteed to contain not more than 5 per cent. of combustible matter.

In addition to the plant already mentioned, the old station contains three Belliss and two Willans triple-expansion steam engines coupled direct to eight J. H. Holmes, one Westinghouse, and one Dick, Kerr

Fig. 4.—Reyrolle Control Switchboard.

dynamos. The smaller engines each drive two generators, while the two 1,500-kW sets have one each; the capacity of this plant is 4,200 kW. In the turbine room besides the new set there is a 6,000-kW Parsons turbo-alternator (installed in 1919), and one 5,000-kW and one 3,000-kW Willans-G.E.C. sets, which were installed in 1917 and 1914 respectively. The 6,000-kW Parsons machine ran for four years without being opened up, and last year it carried 88 per cent. of the station's load. When it was opened, the blades were found to be in perfect condition, and the set's steam economy is to-day as good as it was when tested four years ago.

The auxiliary plant is driven by Laurence, Scott d.c. 500-volt motors, and the generators are all provided with air filters. The turbine room also houses a Bruce Peebles-La Cour 1,500-kW 273-r.p.m. converter, and there are three sub-stations in which the same make of machine is installed, controlled by Johnson & Phillips switchgear; the capacity of the converting plant is 9,000 kW, and an additional machine is on order.

The e.h.p. mains are 0.15, 3-core, paper-insulated, earth shielded and lead covered; they are drawn into fibre and earthenware conduits, operate at 6,600 volts (although they are of 11,000-volt type), and are protected on the Merz-Price balanced system. The l.p. mains are triple concentric and concentric, paper-insulated, lead-covered, and either laid solid or armoured. The cables were supplied by the British Insulated & Helsby Cables, Ltd.

All the pipework was by Messrs. Foster Bros. and the lagging by the Cape Asbestos Co. All feeder pillars used in the undertaking are of a novel type, being the design of Mr. J. R. J. Bowden, chief assistant engineer.

Our thanks are due to Mr. L. L. Robinson for affording us facilities to obtain the above details, to Messrs.

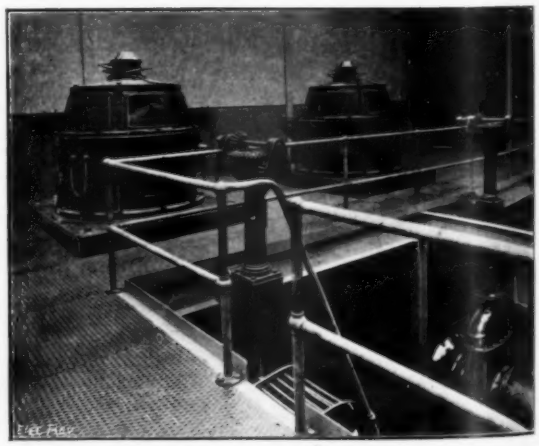


Fig. 5.—Condenser Water Pump Motors.

Babcock & Wilcox for the loan of the photograph of the boiler house, and to Mr. T. Dalby, works superintendent, for his assistance on the occasion of our visit.

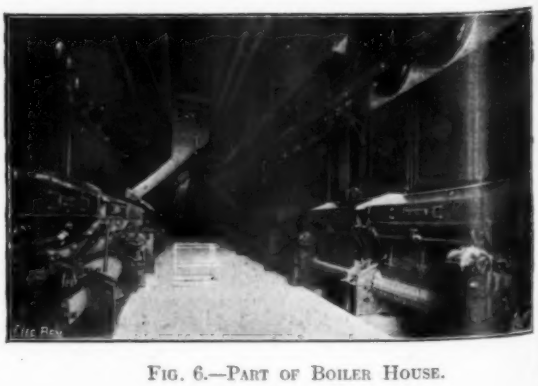


Fig. 6.—Part of Boiler House.

THE DIESEL-ELECTRIC SHIP "LA PLAYA."

A 3,300-b.h.p. Camellaird-Fullagar Installation.

The first Diesel electrically-propelled ship to be built in this country was completed before the war. She was, however, quite a small vessel, so that the *La Playa*, which successfully ran through her trials last month, represents the first real application of electric propulsion of large craft in conjunction with Diesel engines.

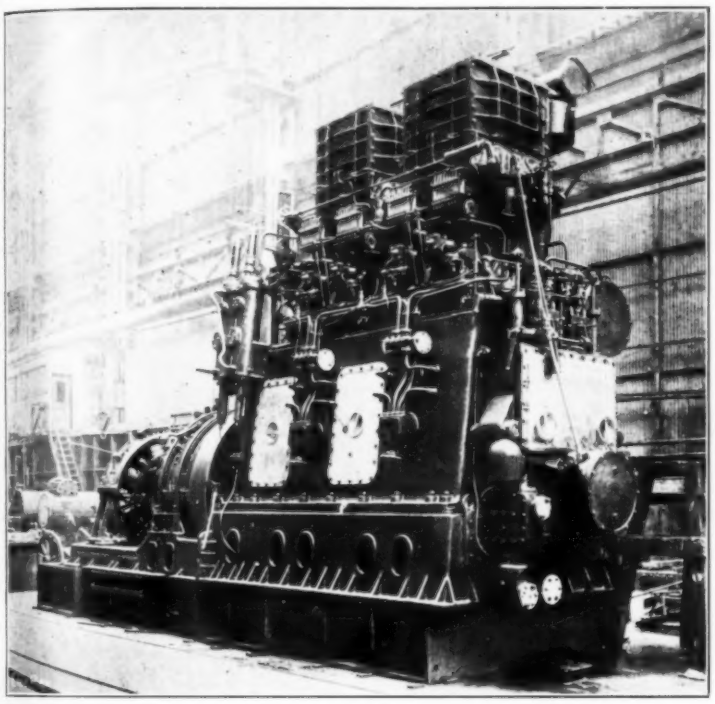


Fig. 1.—An 825-b.h.p. Camellaird-Fullagar Oil Engine.

She is the first of three sister vessels that Messrs. Cammell Laird & Co., Ltd., are building at Birkenhead for the United Fruit Co., of Boston, Mass., U.S.A., and is intended solely for the transport of bananas, mainly in tropical zones, which involves the provision of large refrigerating plant. This factor no doubt influenced her owners to adopt Diesel-electric plant, since the demand for electricity on such a ship is far in excess of what it would be on board an average cargo vessel.

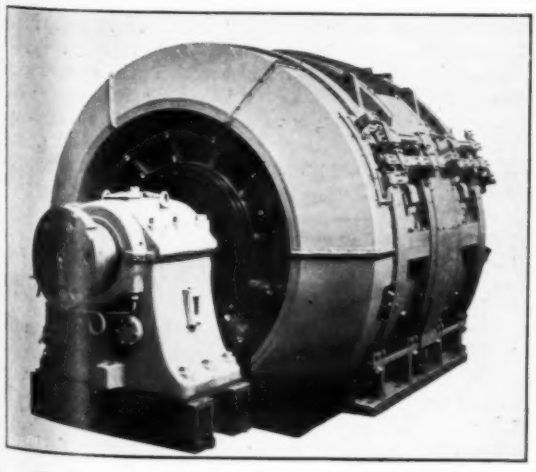


Fig. 2.—The 2,500-h.p. Twin Propelling Motor.

The *La Playa's* dimensions are: Length, b.p., 325 ft.; breadth, mld., 84 ft.; depth to upper deck, 31 ft. 9 in.; and her speed approximately 14 knots. The radio telegraph office and lounge are situated in a deck house at the after end of the bridge. The holds are insulated with cork and cooled on the cold air system.

The refrigerating plant is located in the engine room, and is all electrically driven. It consists of two horizontal single marine-type CO_2 refrigerators driven by an electric motor, and two centrifugal brine pumps coupled to an electric motor. A smaller refrigerating machine with a separate pump is provided for cooling the provision chambers for the ship's use. Four coolers with seven 35-in. Sorocco fans deal with the air supply to the fruit chambers.

An electro-hydraulic windlass, by Clarke Chapman, on the forecastle works the anchors and cables, and an electric winch in the poop aft with extended ends is provided for warping purposes. Eight electric cargo winches, by the Sunderland Forge Co., with single barrel and single drums are placed at the base of the masts for working the derrick gear, and the electro-hydraulic steering gear, by Messrs. Hastie, is controlled by telemotor gear from the wheel house.

In view of the very successful performance of the turbo-electric driven ship *San Benito*, which was built for the United Fruit Co. about two years ago, the owners decided to install the electric drive in the new vessels also, but to substitute Diesel engines for the steam turbines. The adoption of this type of machinery has great advantages from the shipowner's point of view, not only on account of the low consumption of fuel, but also because of the largely increased capacity for cargo which can be obtained in comparison with other vessels of the same class, but driven by steam machinery.

The increased bin capacity of this vessel, as compared with one of the same size fitted with reciprocating steam machinery, is 26.3 per cent., and as compared with one fitted with turbo-electric machinery, 29 per cent. The fuel oil consumption of a vessel with triple expansion engines and of a vessel with turbo-electric machinery, excluding refrigerating machinery, was 31-32

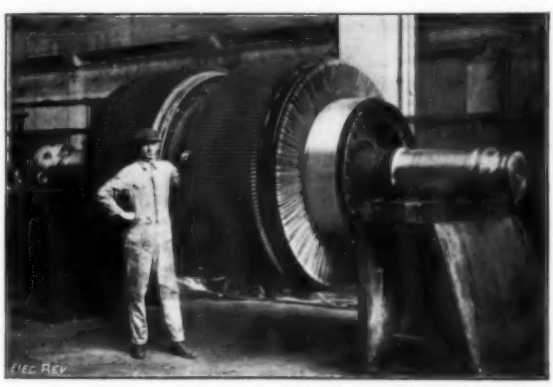


Fig. 3.—Motor Armature.

tons per 24 hours, whereas in the case of the *La Playa* the consumption for similar power is 13½ tons.

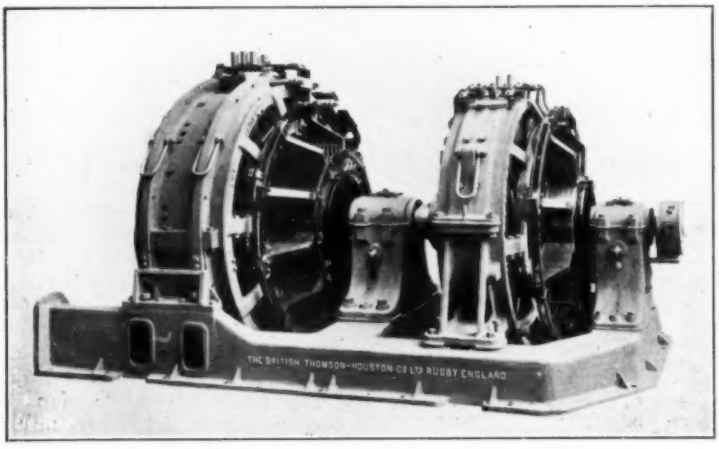


Fig. 4.—Main 500-kW and Auxiliary 200-kW Generators.

The machinery consist of four generating sets arranged in an engine room amidships. Each set consists of a four-cylinder "Camellaird-Fullagar" Diesel engine, fig. 1, developing 825 b.h.p. at 250 r.p.m., directly coupled to a 500-kW 10-pole differential compound commutating-pole main generator supplying d.c. at 220 volts for propulsion, fig. 4.

Each engine also drives an auxiliary 200-kW, 220-volt, 8-pole, shunt, commutating-pole generator arranged in tandem with the main generator, fig. 4, for driving the ship's auxiliaries, the large refrigeration plant, and also for exciting the main generators and the propelling motors. The main generators are electrically coupled in series, and, although all four are in operation at full power, three, two, or only one set may be used at reduced powers if desired, the combined voltages being 880, 660, 440, or 220 according to the number of sets on the propelling circuits. The Diesel engines have cylinders 14 in. in diameter and a 16-in. stroke, with opposed pistons, and follow the usual "Camellaird-Fullagar" two-cycle design as developed for power station work. The engines are entirely enclosed, and as they have no reversing gear and the fuel valves are driven direct by cams mounted on the crankshaft, there is a remarkable absence of external gear.

The consumption of fuel oil per s.h.p. varies little whether 1, 2, 3, or 4 generating sets are working. This feature is of special advantage for when sailing unladen only two or three engines will be necessary, whereas when fruit laden and with the refrigerating plant in operation all the four sets will be required. A further advantage is the security obtained against total breakdown—of essential where a perishable cargo is concerned—for with only two of the four sets in operation, a speed of about 10½ knots can be maintained. The main d.c. propelling twin motor, figs. 2 and 6, is installed in a separate motor room right aft in the ship, and is rated at 2,500 b.h.p. at 95 r.p.m. and 880 volts, with a temperature rise which will ensure safety to the insulation when operating at full power continuously in the tropics. It comprises two 1,250-h.p. 440-volt, 12-pole, shunt commutating machines, each complete with a separate magnet frame, armature, and commutator. The two armatures, fig. 3, are electrically connected in series, and are mounted on a common shaft supported between two pedestal bearings, and it is possible to develop power for about 3/4 speed with only one half of the motor available should the other half break down.

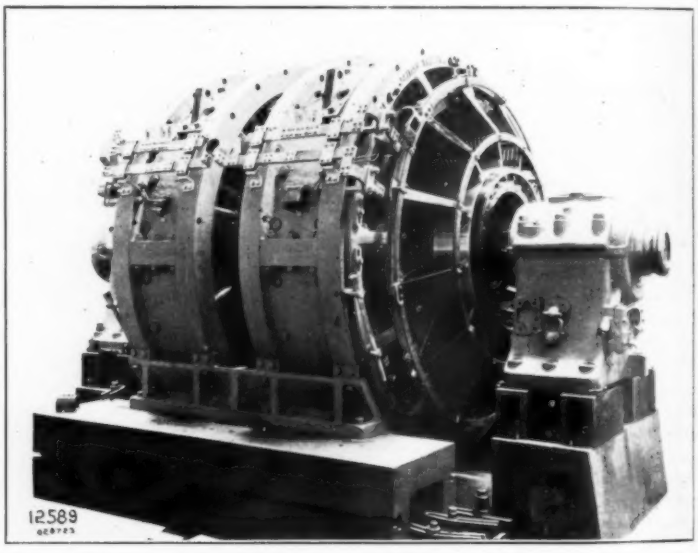


Fig. 6.—Propelling Motor.

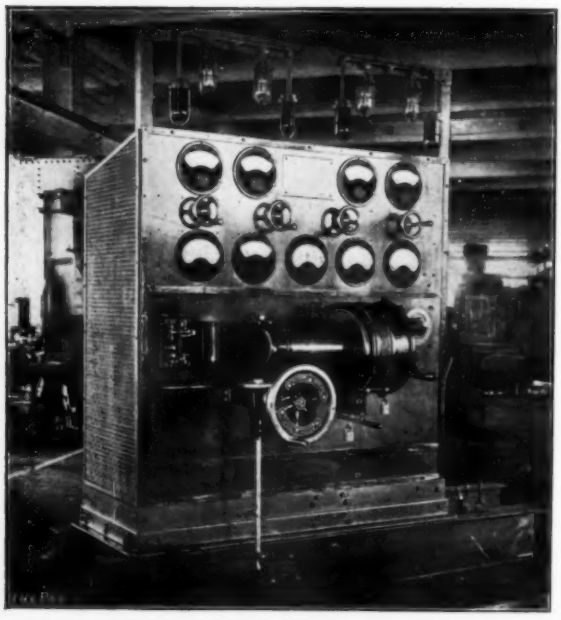


Fig. 5.—A Control Panel.

The whole of the electrical equipment has been designed to meet shipboard conditions in a hot climate; two "Sirocco" fans driven by 18-h.p. motors are arranged to draw air through the propeller motors in order to keep the windings cool in tropical service.

All the propelling generator and motor fields are separately excited from one of the auxiliary generators, and starting, stopping, and reversing of the propeller are effected entirely by varying the excitation of the main generators, or generator, as the case may be. The control arrangements are such that the main propelling circuits are never interrupted, and all regulation and reversing is carried out by varying the field circuits

y. Provision is, however, made for isolating any of generating units as may be desired.

The control is carried out by means of a lever attached a small controller fixed to the front of a sheet-steel el carrying the necessary instruments. This lever es in a fore and aft direction on either side of a tral stop point, and all the operator requires to do en manœuvring is to move the lever on to the speed nt required either ahead or astern.

The actual varying of the propelling generator fields ring manœuvring is effected by means of a reversing entiometer rheostat in each generator field circuit, l all the rheostats are simultaneously operated ough gearing by a small electric motor. A movement the control lever merely switches this motor into cir-it, and by means of follow-up gear the motor switches lf out and stops when it has moved the field rheostats a position where a field strength is obtained on the erators corresponding to the speed point where the er is at rest on the controller.

In addition, a special type of overload current relay placed in the main circuit so that should the operator empt to accelerate or decelerate too quickly and so se an excessive power current to flow in the system, relay interrupts the supply to the small rheostat tor, and although the lever may be operated quickly, varying of the generator field strength is only car-d out when the relay again completes the circuit to small motor. This allows the operator to carry out ers in the quickest possible manner, and safeguards equipment against careless handling.

The instrument panel, fig. 5, is provided with an tric propeller speed indicator showing r.p.m. ahead d astern, one indicating wattmeter for each engine, ich gives the sum of the auxiliary and propelling ds in kilowatts, and enables the operator to see at a nce the load conditions on each engine without having calculate them from the voltage and amperage read-gs of the two generators.

Adjacent to each of these wattmeters is a handwheel means of which the fields on each of the propelling erators can be adjusted and that particular propel-g generator's contribution to the propelling power cuit varied so as to maintain the full kilowatt load the engine. It also enables any particular engine d to be conveniently reduced, if it should be desired to so owing to a minor defect in the engine which is not portant enough to warrant a complete stoppage.

A voltmeter with a 6-point switch is provided to en-le the operator to read the voltage of any of the four in generators, the motor, and the exciter. There is ammeter which reads the propelling power current, ng the same current as is supplied by the generators series; and a wattmeter, also calibrated in electrical se-power, provides a convenient form of measuring the wer developed by the motor without the operator re-ring to make a mental calculation from the varying tage and amperage.

The two last-mentioned instruments are placed near speed indicator, and a hand wheel is conveniently ed alongside which operates a rheostat in the pro-ling-motor field circuit and enables the motor field to varied and the speed consequently adjusted to com-sate for temperature variation, or light-draught con-ions.

As a precaution against failure of the small rheostat-rating motor, which might conceivably fail when nœuvring the vessel in narrow waters, a hand wheel placed close to the control lever by means of which the pelling generator field-rheostats can be manually rated through a full power reversal in about 30 onds.

The auxiliary load is controlled through 5-point tor switches, this arrangement enabling the iliary load to be distributed over the four auxiliary erators and any one of the four propelling generators, ich can be taken out of the propelling circuit for this rpose. In addition, any one (or two, if necessary) of five generators available for auxiliary power can be run at a reduced voltage, this arrangement being principally devised in order to give a convenient speed control to the large refrigerating motors.

The whole of the electrical equipment and control gear have been built by the British Thomson-Houston Co., Ltd., which also carried out the work for the turbo-electric ship *San Benito* for the same owners.

The electrically-driven auxiliary equipment on the vessel is very extensive, all engine-room auxiliaries and deck machinery being electrically driven. The auxiliary power installation, *i.e.*, pumps, fans, compressors, winches, &c., consists of 39 motors, ranging from 1 to 100 h.p., manufactured by the Sunderland Forge and Engineering Co., Ltd., having a total horse power of 950. The installation and wiring in connection with these motors, and the cable work in connection with the main propelling equipment on board the vessel, were also carried out by the Sunderland Forge Co.

One of the principal features of the installation is the main switchboard, 'thwartship at the after end of the engine room. It consists of 15 panels, and has an overall length of 32 ft. Five generator panels are included, one for each of the four auxiliary generators, and the fifth for any of the main generators when used to supply auxiliary load. Indicating lights are fitted on the five panels to show when an auxiliary generator is supplying excitation current for the propelling equipment.

The excitation panel, which is adjacent to the auxiliary generator panels, is also fitted with lights to indicate when the auxiliary generators and main refrigerating motors are operating under separate excitation conditions. The remaining panels are for distributing light and power.

The lighting installation is carried out at 110 volts and power at 220 volts. For lighting purposes at sea a motor generator of 220/110 volts is provided, whilst for harbour use and starting up purposes a paraffin-driven 110-volt, 25-kW generating set is installed.

Provision is made on the switchboard for running the motor generating set to supply 220 volts for running the provision-room refrigerating plant when in port, and when a shore supply is available it can be used in the vessel, suitable arrangements being made for connection to the switchboard bus-bars.

The deck machinery consists of nine Sunderland Forge electric worm-geared winches, each capable of lifting a load of 10,000 lb. at 85 ft. per minute, and fitted with a 32-h.p. motor with watertight control gear; the windlass is driven by a 52-h.p. motor.

A new departure has been made in this vessel by driving the main refrigerating machines, of Messrs. J. & E. Hall's manufacture, by direct-coupled 100-h.p. motors having a speed range of from 165 r.p.m. to 30 r.p.m., special care having been taken to ensure good commutation at the exceptionally low speeds required.

The electrically-driven pumps were supplied by Messrs. Drysdale & Weir; the latter firm also furnished a small air compressor. A De Laval air purifier is installed, and a small oil-fired boiler for heating purposes and for supplying steam to the fruit elevators on shore. The oil fuel is stored in the double bottom.

Progressive trials on a measured mile at Skelmorlie, as well as manœuvring and reversing trials were carried out with remarkable rapidity and certainty, and a five days' cruise round the coast of Ireland was entirely satisfactory.

New York Electrical Exhibition.—The opening of the sixteenth electrical exhibition at New York, on October 18th, illustrated the wonderful extent to which electricity has become the handmaiden of the American household. Mr. Thomas Edison, who presided at the opening ceremony, predicted that the development of electrical devices would be even more marked in the next ten years than in the last decade. He agreed that with their aid a four-hour working day had become possible.

Is Mr. Edison right? It is precisely because we want the blessings of civilisation—including electrical devices—that we go on working for eight hours per day—more or less. If we were content to live in primeval savagery we might have a short enough working day now.

FORTHCOMING EVENTS.

Motor Show.—At Olympia. November 1st-10th.

Institution of Electrical Engineers.—Thursday, November 1st. At the Institution, Victoria Embankment, W.C. At 6 p.m. Paper on "Industrial Research, with special reference to Electrical Engineering Development," by Mr. W. Wilson.

(East Midland Sub-Centre).—Tuesday, October 30th. At Derby Technical College. At 6.45 p.m. Paper on "Economical Generation of Electric Power in Small or Medium-sized Stations," by Mr. S. J. R. Allwood.

Electrical Power Engineers' Association (Southern Division).—Friday, November 2nd. At the Institution of Electrical Engineers, Victoria Embankment, W.C. At 7 p.m. Lecture on "Volumetric Measurement of Coal in Relation to Power-station Problems," by Mr. J. E. Lea.

Edinburgh Electrical Society.—Friday, November 2nd. At the Philosophical Institute, 4, Queen Street. At 8 p.m. Paper on "Efficient Illumination," by Mr. G. Herbert.

Junior Institution of Engineers.—Friday, November 2nd. At 39, Victoria Street, S.W. At 7.30 p.m. Lecturette, "Hydraulic Propulsion," by Mr. D. V. Hotchkiss.

Institution of Mechanical Engineers.—Friday, November 2nd. At the Institution, Storey's Gate, S.W. At 6 p.m. Thomas Hawksley Lecture, "The Mechanical Problems of the Safety of Life at Sea," by Sir W. A. Abell.

Salford Technical and Engineering Association.—Saturday, November 3rd. At the Royal Technical College. At 7 p.m. Short papers on "Competition for the Gold Medal Award," by Mr. W. O. Larmuth.

THE "ELECTRICAL REVIEW" SERVICE DEPARTMENT.

REQUESTS for information must be accompanied by a stamped addressed envelope.

We should be glad if any reader could advise us of the name and address of:—

Makers or suppliers of the "ELECTROLLE" piano player, Patents Nos. 7,233 and 5,278 of 1908.

Makers or suppliers of the "ZEPHYR" fan.

NOTES.

The E.T.B.I.: A Ball at Newcastle.—The Newcastle Local Advisory Committee of the Electrical Trades Benevolent Institution intends holding its fifth annual ball on December 14th, in the Heaton Assembly Rooms. The proceeds are to be devoted to the E.T.B.I. funds.

We would remind readers that the Annual Festival is to be held in London on November 14th, under the presidency of Sir Philip Nash, K.C.M.G., C.B.

Appointments Vacant.—Meter reader and tester for the Aberdare U.D.C. electricity department. Installation superintendent (£275) for the York Corporation Electricity Department.

Institute of Public Lighting Superintendents.—A Glasgow Corporation sub-committee has recommended that the new Institute of Public Lighting Superintendents be invited to hold its first annual conference in the city.

Tramways and Light Railways Association.—The Association's *Journal* for October announces that the annual congress is to be held at Edinburgh on June 26th and 27th, 1924.

Changing-over Networks from d.c. to a.c.—We should be glad if the writer of the letter on this subject, published in our issue of March 9th, 1923, over the pseudonym "Distribution," would kindly forward his address.

American Gift to Cavendish Laboratory.—The Vice-Chancellor at Cambridge has been informed by Prof. Sir E. Rutherford, that the General Electric Co., of New York, has given $5,000 to the Cavendish Laboratory to promote investigations, and the British Thomson-Houston Co. £250 for a similar purpose. Some very appreciative letters accompany the gifts, generously recognising the valuable work carried on at the laboratory.—*Times.*

Fowey Harbour Jetty.—We are informed that the electrical equipment of the jetty at Fowey Harbour, Great Western Railway, of which an account was given in our last issue, p. 580, was manufactured by Messrs. Laurence, Scott & Co., Ltd., of Norwich.

Electric Cookers in Demand.—In March last an Electrical Exhibition was held in Wimbledon, its principal object being to encourage the use of electric cookers. We learn from Mr. A. E. McKenzie, chief engineer and manager, that since that date, and as a direct result of that exhibition, the electricity department, on Monday, connected the 200th electric cooker.

Newport Electrical Exhibition also seems to have been a great success. We are informed that 12,000 people passed through in the first four days, and that several hundred cookers have already been placed.

Electric Homes for Disabled Men.—On Saturday last the Duke of Connaught opened the Hackney war memorial which has taken the admirable form of six model cottages and four flats for local men who were disabled in the war. The cottages are provided with electrical equipment, of which some particulars will be given in a later issue.

Golf.—The Institution of the Rubber Industry and the Rubber Trade Association of Mincing Lane played a match on the Royal Blackheath Golf Club (Eltham) on October 11th in rather indifferent weather; it resulted in a win for the Rubber Trade Association by 9½ to 2½ in the singles, and 3½ to 2 in the foursomes.

Local Electrical Societies.—LIGHTING.—At the opening meeting of the Paisley Association of Electrical Engineers Mr. F. B. Humphriss, the president, in an address gave a comprehensive idea of the great progress being made in efficient lighting methods by the use of modern fittings and reflectors.

HEATING AND COOKING.—At a meeting of the Edinburgh Electrical Society, on October 19th, Mr. M. Leak, of the British Electric Transformer Co., Ltd. (Tricity), delivered a lecture entitled "Electric Heating and Cooking," in the course of which he dealt with the subject from its earlier days up to the present. Many interesting comparisons were made between electric and gas heating and cooking and some test results brought forward showed that the application of electricity to domestic cooking was a favourite proposition. The lecture was well illustrated with a series of attractive lantern slides.

WATER POWER.—Mr. W. Tatlow, in a paper which he read before the Engineering and Scientific Association of Ireland at Dublin recently, dealt with "The Principle of Water Power Development."

The next meeting of the Electrical Society of Glasgow will take place on November 20th. Mr. W. E. Bush, of the British Thomson-Houston Co., Ltd., will read a paper on "Illumination."

Dinner.—The fifth annual dinner of the Royal Naval Division Signal Company will take place at the Engineers' Club, Coventry Street, on Saturday, November 3rd, at 6.30 for 7 p.m. Tickets, price 7s. 6d., may be had on application to the Hon. Secretary, Mr. J. N. Robertson, 14, Woodville Grange Avenue, Ealing, W.5.

Faraday House Old Students' Association.—ANNUAL DINNER.—On Friday last the annual dinner of the Association was held at the Hotel Cecil, Mr. H. W. Miller, M.I.E.E., president, occupying the chair. The principal guest was Dr. A. Russell, President I.E.E. and Principal of Faraday House, and the assembly of some 250 members and guests included many men in the foremost ranks of the profession and industry.

After the loyal toasts had been duly honoured, Mr. W. W. Lackie, C.B.E., electricity commissioner, proposed "Faraday House and its Old Students." He knew many old Faradians, all of whom had done well in their profession, and held leading positions in all parts of the world. To Dr. Russell was due the high reputation of Faraday House.

Responding, Dr. Russell, who received an ovation, said that the college was being re-equipped throughout; in 1919 it was affiliated with 71 works, power stations, and electric railways; now the number was 139, including 81 works. Their continued prosperity was due to their old students and to the support of firms, at the head of which were old Faradians.

Mr. A. F. Berry, past-president of the Association, proposed "The Guests," and Sir James Devonshire, K.B.E., responded.

Mr. R. J. Wallis-Jones, O.B.E., then proposed "The Chairman," of whose career he gave many interesting reminiscences. The toast was accorded musical honours, and Mr. Miller, responding, said that when he began to employ Faradians he found that they were preferred to students from other colleges. He then presented to Dr. Russell, in the name of all Faradians and the staff of Faraday House, a handsome cabinet of silver and a gold cigarette case to mark his election as president of the Institution of Electrical Engineers—a fitting tribute to the value of his work in engineering and on the Council. The gift bore witness to the affection and esteem which he had inspired in the hearts of all old Faradians, of whom 600 took part in the gift.

Dr. Russell, on rising, was greeted with a second ovation. Returning thanks, he said it was 34 years since he first came to "Faradia," and some of his very first class were present that night—the most industrious class he ever met. Two members of the class had sons who had gained the highest entrance scholarships at Faraday House. He had stood *in loco parentis* to some 1,500 Faradians.

A musical entertainment followed, which was heartily enjoyed.

Teachers' Qualifications.—The Board of Education has issued (through H.M. Stationery Office, price 1d.) Appendix III to the report of the Standing Joint Committee on Salaries for Teachers in technical schools, schools of art, junior technical schools, evening schools, and day continuation schools, which gives a list of the qualifications equivalent to a degree recognised under Clause 6 of the report, and also correspondence between Lord Burnham and the president of the Board

The Electrical Power Engineers' Association.—Annual Dinner.—On Saturday, October 20th, the annual dinner given by the Southern Division to the National Executive Council was held at the Hotel Cecil. Mr. J. H. Parker, past-president, was the chairman, and there was a large attendance.

After the toast of "The King" had been given by the chairman, Captain J. M. Donaldson, M.C., proposed "The Association." Referring to the dispute between the Association and the Corporation of Halifax, he suggested that what it on both sides it might be settled before the end of this ar. He recommended to them two simple axioms: Hear other side; and put yourself in the other man's place. ntil this Association was formed the station engineer had a r chance; his long training and high responsibility were r recognised, but having acquired power it was well for m to remember that the employer was very human—moreer, he was a Britisher, and a display of force was not the st method of getting anything out of him. The toast was plied with the name of the president, Mr. W. J. Oswald, d was accorded musical honours.

Next Mr. J. H. Parker proposed "The Guests," amongst om were members of the employers' side of the National int Board, who had laid the E.P.E.A. under a debt of titude for their public spirit in devoting their time to such ork. No one had done more for the Association than Alderan W. Walker, who in the early days succeeded in forming truly representative body, and by his personal efforts perauded authorities all over the country to adopt the first hedule. He also thanked the members of the N.E.C. for ving their time and risking their future in the interests of Association.

Mr. Oswald then presented to the immediate-past-president Mr. Jeffery) a silver salver and silver tea service, with a gold ngle for Mrs. Jeffery, in token of the appreciation of the sociation of his splendid work during the past year, which as one of the critical years of the Association. Mr. Telford, behalf of the northern members and the National Executive Council, also paid a tribute to the labours of Mr. Jeffery, who expressed his sincere thanks for the gifts.

Later in the evening Mr. Oswald, replying to the toast of The Association," said that they were proud of it and of the y in which it had worked for the benefit of the industry. s main object was to raise the status of the power-station ngineer. It took its stand on Whitleyism and the avoidance disturbance in the industry, and would strive to keep the ational Joint Board functioning. It must also have relaons with the manual workers to achieve its object. Now at agreement regarding salaries had been arrived at the ational Joint Board would be able to give attention to other atters, such as the adequate training of engineers, which as of vital importance. Prosperity could only be secured co-operation between the employers, the staff, and the mployés, all working for the good of the industry as a whole.

Responding to the toast of "The Guests," Ald. Walker eviewed the history of the formation of the National oint Board. At the earliest stages it became manifest that it was absolutely necessary to raise the salaries of the staffs in a large number of undertakings, and a basis was stablished in the first schedule. The parties worked amicably together until last year, when the employers took exception to certain clauses in the belief that they were bad for the ssociation as well as for themselves. Both sides sincerely believed that they were acting for the best. Now a splendid olution had been found—they had agreed that any insoluble uestion should be referred to arbitration. That ended the rouble. He would be extremely sorry to let the National oard go out of existence; the District Boards were an estabished factor in the industry. The Halifax negotiations were n his hands, so he could not say more than that a marked dvance had been made towards a solution. When underakings refused to adopt agreements the employers' side had ooked the complaints of the E.P.E.A. The Association had ade more progress during its brief existence than a well-known trade union in 30 or 40 years, largely due to its fine uccession of presidents.

Mr. A. H. Allen responded for the Press, comparing the ork of the Association with the functions of a lightning onductor; and Mr. T. A. G. Margary, responding for the adies and for the National Executive Council, said that when the salaries question was out of the way the Association could et on with the important task of securing the right type of men for the electricity supply industry. They wanted to stabilise the position, and they were associated with the manual workers for the sake of maintaining peace in the industry and ensuring that agreements would be honoured.

The Chairman called for thanks to the Dinner Committee, especially Mr. Hiett, for the excellent arrangements that had been made. The speeches were interspersed with a musical programme, and a successful evening closed with "Auld Lang Syne."

Service Notes.—Lieutenant-Commander J. S. Morrell has been appointed to the charge of the wireless station at the new naval base of Singapore, and Lieutenant M. J. W. Ellingworth to the charge of the wireless station at Seletar, which will be worked in connection with the first-named station. The spending of nearly £10,000,000 at Singapore will include a good deal of electrical business.

INSTITUTION NOTES.

Institution of Electrical Engineers.—The opening meeting of the 1923-24 session of the Institution took place on the 18th inst., there being a good attendance. Mr. F. Gill, the retiring president, presented the premiums awarded for papers submitted last session and also the scholarships that the Council has awarded. He then introduced the new president (Dr. Alex. Russell), who called on Dr. S. Z. de Ferranti to propose a vote of thanks to Mr. Gill, which was seconded by Mr. Ll. B. Atkinson, and carried with acclamation. Dr. Russell then read his address, an abstract of which is given elsewhere in this issue. The meeting terminated with a vote of thanks to the President, which was proposed by Sir R. T. Glazebrook and seconded by Mr. C. P. Sparks.

Change of Date.—The joint meeting with the British Section of the Société des Ingénieurs Civils de France, which was to have been held on Thursday, November 15th, has been postponed to Thursday, November 22nd, when a paper by M. Bachellery entitled "The Electrification of the Midi Railway" will be read and discussed.

Scholarships.—The following scholarships have been awarded for 1923-24:—

A Salomons Scholarship (value £50),
to Mr. James Linton (Heriot Watt College, Edinburgh).

David Hughes Scholarships (value £50 each),
to Mr. R. MacWhirter (Royal Technical College, Glasgow), and
Mr. R. E. Banks (The University, Birmingham).

Institution of Civil Engineers.—The Council has made the following awards in respect of selected engineering papers published without discussion during the session 1922-23: A Watt Medal to Mr. T. E. Houghton, M.Eng.; and Telford Premiums to Messrs. J. W. Meares, C.I.E., J. W. Spiller, G. S. Coleman, D.Sc., and Dempster Smith, M.B.E., M.Sc.Tech.; and in respect of papers read before meetings of students of the Institution during the same period: Miller prizes to Messrs. E. L. Everatt, J. G. Kimber, A. H. Naylor, M.Sc., E. Sykes, and F. J. Symonds.

Institute of Transport.—The fourth annual general meeting of the Institute will be held on Monday, November 5th, at the Institution of Electrical Engineers, Victoria Embankment, at 5.30 p.m. Reception by the president at 5 p.m.

Institution of Mechanical Engineers.—The presidential address, delivered by Sir John Dewrance, K.B.E., on Friday last, took the form of a review of engineering progress and modern systems. Speaking of the present patent system, he said that the time and trouble thus expended was gradually giving way to joint research by members of an industry. He instanced the work of the British Electrical and Allied Industries Research Association as an example of this. It was pointed out, however, that great care must be exercised in deciding which subjects were suitable for co-operative research and which could best be treated in the drawing office. The speaker mentioned a number of directions in which useful research was being carried out.

Turning to standardisation, Sir John referred to the confusion which arose with regard to the first railway gauges, and commended the work of the British Engineering Standards Association. He asked members of the Institution to assist the work of the Association by making suggestions with regard to many branches of mechanical engineering. The address was concluded by a few remarks upon the training of engineers, outlining a shop and drawing-office programme which appeared to meet the needs.

Junior Institution of Engineers.—Bequest.—The Institution has for many years past been enabled, through the generosity of the late Mrs. E. O. Durham (wife of Lt.-Col. F. R. Durham, C.B.E., M.C., M.Inst.C.E., chairman of the Institution from 1907 to 1909), to offer annually a bursary of £25 for competition amongst members between the ages of 20 and 23 years. Mrs. Durham has bequeathed to the Institution a sum sufficient to endow the bursary in perpetuity.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

The chairman of the Mersey and North Wales (Liverpool) Centre of the Institution of Electrical Engineers, Mr. E. M. Hollingsworth, was educated at St. Helens, and received his technical training at the School of Technology, Manchester, and in the shops and drawing office of Messrs. Robinson, Cook and Co., St. Helens. On the completion of his apprenticeship he was appointed assistant engineer to the Gas and Electricity Department of the St. Helens Corporation, and, under the direction of the late Mr. Robert Hammond, prepared the scheme for the first power station and distribution network on the a.c. single-phase, 2,000-volt system, which was completed in 1897.

Twelve months later the Electricity Committee of the Corporation decided to construct a new station in a more suitable position for the generation of direct current, and also to electrify the 20 miles of tramways. The late Dr. John Hopkinson was retained as consultant for this scheme, and Mr. J. S. Highfield was appointed electrical engineer. Shortly afterwards Dr. Hopkinson met his untimely death in the Alps, and Mr. Highfield was then made responsible for the work, and, with Mr. Hollingsworth as his chief assistant, completed the scheme in 1899. In 1903 Mr. Highfield accepted the appointment of chief engineer to the Metropolitan Electric Supply Co., Ltd., and Mr. Hollingsworth succeeded him as chief electrical engineer at St. Helens.

In 1908 the Electricity Committee, under the chairmanship of the late Sir Joseph Beecham, decided to change the system

Medringtons, Ltd. [*Liverpool.*

Mr. E. M. Hollingsworth,

Chairman of the Liverpool Sub-Centre of the I.E.E.

of generation to three phase, at 6,600 volts, and Mr. Hollingsworth was responsible for the modernising of the undertaking, which included the installation of turbo-alternators, water-tube boilers, rotary converters, e.h.p. feeders, and static sub-stations. He retained his position as chief engineer to the Corporation until he resigned in 1919 to take up his present appointment as electrical engineer to the United Alkali Co., Ltd., whose new large power station on the banks of the Mersey has recently been described in our columns. In the early days at St. Helens, Mr. Hollingsworth was closely connected with technical education, being responsible for the equipment of the engineering laboratories at the Gamble Institute, and for eight years he directed the engineering evening classes at that Institute. Mr. Hollingsworth is a member of the Institution of Electrical Engineers and of the Institution of Mechanical Engineers and the Liverpool Engineering Society; he has read papers before the latter Society and the Incorporated Municipal Electrical Association. Previous to the formation of the Liverpool Sub-centre, he served for a number of years on the committee of the North-Western Centre in Manchester.

Mr. Robert N. Tweedy, M.I.E.E., A.M.I.C.E.I., consulting engineer of Dublin, is the new chairman of the Irish Centre of the Institution of Electrical Engineers. He delivered his inaugural address to the Centre last night. Mr. Tweedy has had a very full and varied career, both technically and in the general public service. Following his education at Blundell's School and training with the Brush Electrical Engineering Co., Ltd., and at Owen's College, he became assistant engineer at the Coatbridge station of the Scottish House-to-House Electricity Supply Co. Then came a year at sea, followed by some years with the British Electric Traction Co., Ltd., first as assistant engineer at Kidderminster and Stourport Tramways undertaking and later as chief. His next post was as chief of the Dudley, Stourbridge and District Tramways. Marriage to Miss Marsh, sister of Mr. J. M. T. Marsh, the then electrical engineer to the Dudley Corporation, was his next venture. From the Dudley appointment, Mr. Tweedy turned his attention to electrical contracting work, becoming manager for Dublin and the South of Ireland for Messrs. William Cote and Son, Ltd., of Dublin. In the course of events he became Senior Electrical Officer (Irish Area) A.C.S., R.A.F., and after demobilisation he started in practice as a consulting engineer. From 1919 to 1921 he was a member of the Dail Eireann Commission of Inquiry into the Resources and Industries of Ireland. He has acted as arbitrator in many industrial disputes, and as chairman of certain Conciliation Boards or Councils. The report is now in the Press of the Saorstat Eireann Canals and Waterways Commission, of which Mr. Tweedy was chairman. In the course of his career Mr. Tweedy has contributed many articles to the pages of the Electrical Review, and latterly he has written much in the Irish papers on industrial development, farm tractors, and industrial alcohol. The Institution of Electrical Engineers some years ago awarded him a special premium for a paper on overhead construction. At the present moment a Dublin firm of publishers is bringing out a small book from his pen explaining to young people the constitution of the Irish Free State.

In our issue of July 20th, under "Service Notes," we referred to Captain R. L. Aiken having been posted to the Corps of Royal Engineers (Electrical) Reserve. The correct spelling of the name is R. L. Alken.

Mr. R. E. Rushworth, of Bingley, has been appointed electrical engineer to the Skipton District Council (at £287 per annum). The Council has recently established a local lighting service by means of a bulk supply furnished jointly by the Yorkshire Electric Power Co. and the Keighley Corporation. There were 110 applicants for the post, and six were selected for interview.

The Finance Advisory Committee of the Bradford Corporation has approved a recommendation of the Electricity Committee that Mr. Thos. Roles, M.I.E.E., city electrical engineer, be nominated for election to represent Bradford as an Associate Member of the British Electrical and Allied Industries Research Association in consideration of the payment, for a period of five years, of a subscription of £50 per annum.

The Lord Mayor of Liverpool has resigned the chairmanship and membership of the Merseyside Electricity Committee, the City Council having withdrawn from the provisional scheme. Mr. James Scott (Bootle) is to be nominated for the vacancy.

The Sidmouth Urban Council has appointed Mr. H. Burgess as joint manager of the gas and electricity works, at a minimum salary of £400 per annum, and Mr. P. C. Tracey, of Swansea, as charge engineer, at £4 per week.

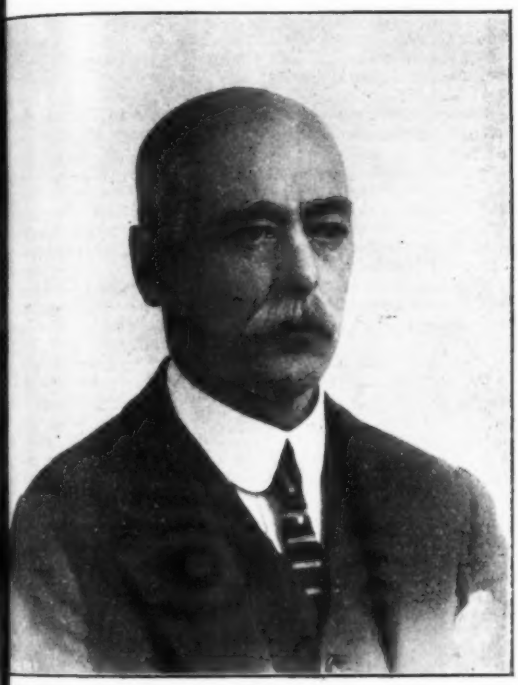
The address of Mr. F. C. Raphael, M.I.E.E., is 19, Ludgate Hill, E.C.4, not 9, Ludgate Hill, as stated (through a printer's error), in the new Telephone Directory.

On October 18th, at 4, Central Buildings, Westminster, Mr. O. H. Baldwin presented a silver cake basket to Mr. A. C. Noad from his colleagues in the supply department of Metropolitan-Vickers Electrical Co., Ltd. For the past two years Mr. Noad has been in charge of the "Cosmos" lamp sales, and he has now resigned his position with the Metropolitan-Vickers Co. to return to the U.S.A. Previous to joining the Metropolitan-Vickers Electrical Co., Mr. Noad was with the English Electric Co., Ltd., and Watlington & Co.

Obituary.—Mr. A. L. Dearlove.—We regret to record that Mr. Arthur L. Dearlove, the well-known submarine cable consulting engineer, passed away on October 19th, at 41, Hill Street, Berkeley Square, London. He had been ailing for some time but was deeply engrossed in business affairs until within a few weeks of his death.

Mr. Dearlove was born in 1859, and, after being educated privately and at King's College, he entered the workshops of Latimer Clark, Muirhead & Co., where he underwent mechanical training and subsequently worked as an assistant in the firm's laboratory. During the three years spent in these ways he was engaged in the production of apparatus supplied to various submarine telegraph companies. The establishment of duplex working between London and Emden and other cable work occupied his attention in 1878, and in the following year he joined the firm of Clark, Forde & Taylor, civil engineers, with whom he has been prominently identified right up to his death. He was admitted a partner in 1898, and was latterly senior partner. His work has been mainly that of a consulting engineer, and it is understood that he had supervised the laying of considerably more than 100,000 nautical miles of submarine cable. In 1888 he was engaged upon work of this class for Henley's between Venezuela and various other places; three years later he established duplex working on the cables of the Brazilian Submarine Telegraph Co. at stations in Europe and South America; later he conducted much experimental and research work and developed submarine telegraph apparatus which the leading companies adopted. He acted in a consultative capacity for the Pacific Cable Board, the Western Union and Commercial Cable Companies; but he was also employed in executive capacities for foreign governments. He wrote many valuable papers as the result of his experimental investigations in cable engineering. During the period of the war, as would be supposed, his services were required in very special ways in connection with submarine cables. It will be gathered that by his death this important department of the electrical profession and industry has lost a most eminent

chnical and executive authority, and those who have come into contact with him will miss a friend whom it was impossible not to esteem. The funeral service took place on Tuesday morning at Golders Green Crematorium. Those present included: Major C. Turner-Jones, R.E., Mr. Adrian Newell, Mr. Eric Newell, and Mr. Allan Fyffe (relatives), Mr. S. Heurtley (partner in the firm of Clark, Forde and Taylor), and many other gentlemen representing various submarine cable interests. Among these were the following: Mr. F. J. Adye (secretary, Pacific Cable Board), Sir Charles Bright, F.R.S.E., Mr. S. G. Brown, F.R.S., Sir George Buchanan, K.C.I.E., Captain V. Campos, O.B.E. (C.S. *Colonia*), Messrs. T. Clack (Telegraph Construction and Maintenance Co.), W. H. Coade (All-America Cable Co.), F. J. Cole (manager, Telegraph Condenser Co.), A. P.



Langfier, Ltd.] [London.

THE LATE MR. A. L. DEARLOVE.

Leach (secretary, India Rubber, Gutta Percha & Telegraph Works Co.), A. Davidson (vice-president, All-America Cable Co.), J. J. Delahanty (Commercial Cable Co.), A. E. Foster (Siemens Bros. & Co., Ltd.), S. J. Goddard (vice-president, Western Union Telegraph Co.), H. F. Hesse (Eastern Telegraph Co.), R. J. Hughes (Commercial Cable Co.), H. Kingsbury (Western Union Telegraph Co.), D. Lucas (Telegraph Construction & Maintenance Co.), R. W. Paul, R. H. Peet (Siemens Bros. & Co.), E. Stallibrass (Clark, Forde & Taylor), W. Steventon (Commercial Cable Co.), T. H. Tebbett (Clark, Forde & Taylor), Commander Robinson, R.N., &c.

Wills.—The late Mr. WM. TOZER, a director of Steel, Peech and Tozer, now the United Steel Companies, Ltd., left £46,559 gross and £23,051 net personalty.

The late Mrs. HERTHA AYRTON left £8,160 gross and £7,598 net personalty.

NEW COMPANIES REGISTERED.

Fry & Co., Ltd. (192,801).—Private company. Registered October 1st. Capital, £2,100 in £1 shares. To acquire the business of electrical and mechanical engineers and manufacturers now carried on at Tipping Street, Ardwick, Manchester, as "Fry & Co.," and to carry on the business of electrical, mechanical, vehicle and haulage engineers, repairers and manufacturers of, and dealers in electrical, magnetic, telegraphic, telephonic and other appliances and apparatus, garage proprietors, motor, taxicab, omnibus, cab, fly, and other public or private conveyance proprietors, &c. The first directors are:—G. T. Fry, 25, Powell Street, Old Trafford, Manchester; A. T. Barratt, "Barnfield," Bury New Road, Prestwich; A. L. Lord, "Leckthwaite," Sudden, Rochdale. Qualification, 500 shares. Secretary: A. L. Lord. Registered office: Maskell Street Works, Maskell Street, Rusholme Road, Manchester.

Bell Electrical Co. (Northern), Ltd. (193,069).—Private company. Registered October 15th. Capital, £100 in £1 shares. To acquire the benefit of certain concessions relating to the manufacture of electrical distribution boards, and to carry on the business of manufacturers of, agents for, and dealers in electrical and other apparatus. The subscribers (each with one share) are:—B. Bell, 4, Portlands Place, Halifax, electrician; L. Leach, 1, Brighton Street, Lee Mount, Halifax, merchant; C. P. Spencer, Palatine Chambers, Halifax, chartered accountant. The first directors are named. Secretary: C. P. Spencer. Registered office: Palatine Chambers, 6, Market Street, Halifax.

Peter Curtis, Ltd. (193,067).—Private company. Registered October 15th. Capital, £100 in £1 shares. To establish, work, manage, control, and regulate wireless telephone and telegraph exchanges and works for the supply of electric light, &c. The first directors are:—T. Dalzell, 20, Hampstead Road, N.W., engineer; A. C. S. Cauldwell, 7, Queen's Road, South Norwood, S.E., engineer. Registered office: 84, Whitfield Street, W.1.

Malmesbury Electric Supply Co., Ltd. (193,109).—Private company. Registered October 16th. Capital, £6,000 in £1 shares. To carry on the business of an electric lighting and power company, &c. The first directors are:—J. H. Edwards (managing director), "Woodside," Cranham, Stroud, Glos., electrical engineer; Capt. E. M. S. Mackirdy, The Abbey Mouse, Malmesbury, Wilts. The company may give to any person lending money to them the right to nominate a director or directors. Qualification, 50 shares. Secretary (*pro tem.*): A. L. Forrester. Registered office: The Electricity Works, Malmesbury, Wilts.

Upton & Garrett, Ltd. (193,172).—Private company. Registered October 18th. Capital, £1,000 in £1 shares. To acquire the business of electrical and wireless engineers now carried on at Electric House, Church Lane, Edgware, Middlesex, as "Upton & Garrett." The subscribers (each with one share) are:—E. W. Upton, 3, Whitchurch Lane, Edgware, electrical engineer; R. S. Smallman, 8, Queen Street, E.C.4, solicitor. The first directors are to be appointed by the subscribers. Qualification, 100 shares. Registered office: Electric House, Church Lane, Edgware.

Radio Works, Ltd. (193,148).—Private company. Registered October 18th. Capital, £100 in £1 shares. To carry on the business of manufacturers, importers and exporters of, and dealers in wireless, radio, and electrical parts and accessories, electric, magnetic, galvanic, and other apparatus, &c. The subscribers (each with one share) are:—A. Crate, 17, Russell Grove, North Brixton, S.W.9, solicitor's clerk; C. H. Treble, 15, Charlemont Road, East Ham, E.6, solicitor's clerk. The first directors are not named. No share qualification required. Registered office: Bank Chambers, 329, High Holborn, W.C.2.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Premier Private Telephone Co., Ltd.—Mortgage dated September 29th, 1923, to secure £330, charged on 43, Oliver Street, Stockport. Holders: Halifax Equitable Benefit Building Society.

Insulated Cap and Rivet Co., Ltd.—Debenture dated October 9th, 1923, to secure all amounts payable under a guarantee not exceeding £500, charged on certain leasehold premises in Junction Road, Highgate, a lease dated March 16th, 1919, at £125 per annum, plus insurance, and the company's other assets, present and future, including uncalled capital. Holder: K. W. E. Edgcumbe, Aldenham Grange, Watford.

Parlophone Co., Ltd.—Particulars filed of £25,000 debentures authorised October 8th, 1923, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

British Gramophone and Wireless Co., Ltd.—Debenture dated September 19th, 1923, to secure £450, charged on two debentures for £1,000 each in the C. H. Roberts Manufacturing Co., Ltd., and the company's undertaking and property, present and future, including uncalled capital. Holders: L. T. Reynolds and H. Reynolds, c/o Reynolds & Sons, 7, Arundel Street, Strand, W.C.2.

General Radio Co., Ltd.—Particulars filed of £6,000 debentures authorised August 13th, 1923, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £3,500.

West Central Manufacturing Co., Ltd.—First mortgage debenture dated October 8th, 1923, to secure £200, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: F. W. Bristow, "Fleetwood," Hatherly Crescent, Sidcup.

Ferguson, Pailin, Ltd.—Deposit (without instrument) on September 25th, 1923, of deeds of land, certain leasehold land and property, in Buckley Street, Higher Openshaw, Manchester, to secure all moneys due or to become due from company to Williams Deacons Bank.

Frank Craft (Castleford), Ltd.—Mortgage debenture charged on the company's freehold, leasehold, and copyhold property, uncalled capital and undertaking, present and future, dated October 3rd, 1923, to secure all moneys due or to become due from company to Lloyd's Bank.

I. T. C., Ltd. (99,612).—Return dated September 20th, 1923. Capital, £20,000 in £1 shares. 15,000 shares taken up. £15,000 paid. Mortgages and charges, nil.

H. G. Cooper, Ltd.—Satisfaction in full on March 16th, 1923, of debentures dated April 28th, 1916, securing £500.

Sanders, Kennedy & Co., Ltd.—F. J. Sally, of Bank Chambers, Bridgwater, was appointed receiver and manager on October 13th, under powers contained in first mortgage debenture, dated September 17th, 1923.

Reeve & Bayman, Ltd.—E. H. Hawkins, of 4, Charterhouse Square, E.C., ceased to act as receiver or manager on June 14th, 1923. (Notice filed October 11th.)

CITY NOTES.

Victoria Falls and Transvaal Power Co., Ltd.

The Marquess of Winchester presided at the annual meeting on October 18th. In moving the adoption of the report (*vide* ELEC. REV., October 5th), the chairman, referring first to the balance sheet, said that the share capital still remained at £3,000,000. The actual amount of first mortgage debentures outstanding at the end of the year was £1,625,750, but, adding the amount representing debentures drawn for redemption, but not presented for payment, made the total figure £1,777,880. The second mortgage debentures including those drawn but not presented for payment stood at £1,145,041, the amount of £56,840 having been redeemed during the year. The creditors and credit balances stood at £1,444,451, those in London amounting to £1,356,143. The reserve fund remained unchanged at £250,000. Referring to the other side of the balance sheet, the leases

and concessions, &c., and the company's power stations, buildings, equipment, and land, stood at £1,398,964 and £1,587,923 respectively, the amounts written off for depreciation mainly accounting for the reduction in those figures. The company's advances to the Rand Mines Power Supply Co., and the 500,000 shares in that company stood together at £2,349,595, which advances were fully secured by a first charge over the Rand Mines Power Supply Co.'s whole undertaking. The debtors and debit balances amounting to £100,494, included the usual trade debts owing at the date of the accounts. Cash and investments amounted altogether to £2,267,346. Turning to the profit and loss account, the receipts amounted to £780,113, as compared with £784,425 last year. Debenture interest amounted to £149,287, being £11,599 less than in the previous year. Depreciation and amounts written off, including the provision made for British taxation, amounted to £380,046. Last year attention was drawn to the fall in mining costs. Some of the shareholders wrote to say that they did not appreciate the bearing that that had on their business. His reason for devoting so much attention to that point was that about 95 per cent. of their business was derived from supplying power to the mining industry, and he tried to point out that the reduction in working costs had re-established certain low-grade mines, which otherwise were in danger of being closed down, and had improved the estimated lives of many others. The report and balance sheet, and the increase of dividend on the ordinary shares, which they felt was their due, had further extended the interest of the investing public in the company. They were only just recovering from the set-back of the war, which raised everything they needed to buy to fictitious prices. Provided the native labour supplies continued satisfactory, and labour was satisfied with present rates of wages, he anticipated that the report next year would show continued progress. The erection of their new station had been delayed by the necessity imposed upon them by the Electricity Act of 1922, of obtaining a licence from the Electricity Control Board. Recently there appeared in the Press a notice that at the instance of one of their consumers, an interdict had been granted restraining the Electricity Board from proceeding with the inquiry respecting the granting of their application for a licence to erect a new station at Witbank, the reason being that some particulars stipulated in the Electricity Act had not been supplied by the Power Co. They were, happily, able to inform the Press the following day that the interdict had been withdrawn. The price of coal represented about 50 per cent. of the working costs. The selection of Witbank at a distance of 60 miles from the Witwatersrand was due to the advantage of being able to obtain there and turn to account certain coal not unlimited in amount, which was not of value for other purposes. The amount available would be sufficient for the additional plant. The period of their existing power contracts varied, some terminating in 1926, whilst others ran on until 1931, the mines having the right to renew for five-year periods at the expiration of their existing contracts at the existing price for power. They further had a participation in the company's surplus revenue, after provision for standing charges. The conditions regulating the participation were somewhat difficult of interpretation; they had, therefore, already shown that they would be ready to enter into fresh contracts with all the groups embodying a simplification of the participation account. The chairman did not believe that the Electricity Commissioners would desire to enter into competition for supply in the company's area provided that it continued efficiently to discharge the duties of a public electricity undertaking. The trend of the discussions which had taken place up to the present had shown that the Commission had not the intention of hampering the enterprise of those who had already invested their capital in order to make available a cheap supply of electricity. The official inquiry regarding their application for a licence to erect a station at Witbank had not yet been completed. From the information they had received regarding the preliminary discussions, it was foreshadowed that satisfactory arrangements would be authorised whereby the company would be able to erect plant at Witbank and to transmit power to the Rand; further, when the railways were electrified the Commission would buy the station from them and sell them a bulk supply.

Electric Supply Co., of Victoria, Ltd.

The report for the year ended March, 1923, shows that the lamps connected advanced from 329,242 to 352,477; the tramway passengers carried fell from 6,035,062 to 5,507,082. The revenue was £147,549 against £139,068 for the previous year, and the expenditure £99,175 against £98,959; leaving a gross profit of £48,375 against £40,108. Including the sum brought forward the available amount is £93,001, and from this debenture interest takes £4,841, debenture stock redemption £9,456, and reserve for Imperial taxes, £3,400. It is proposed to pay one year's preference dividend, 6 per cent., requiring £10,500, and to carry forward £64,803. A large extension of the generating plant at Ballarat and Bendigo is contemplated, also a change-over of the system of supply in both towns from direct to alternating current, involving very heavy capital expenditure. Under these circumstances, although the balance to the credit of profit and loss account would permit of the payment of a dividend on the ordinary shares, the board do not think it advisable to do so at present. Debenture stock redeemed date is £108,682. The directors refer with great regret to deaths of Mr. G. Crosland Taylor and Dr. E. K. Muspra directors for many years.

Ferranti, Ltd.

The annual meeting was held on Oct 18th, Mr. A. W. Tait, C.B.E., presi In proposing the adoption of the rep which was reviewed in our issue of October 12th, the ch man said that last year the profits were adversely affected the dispute in the engineering trade. During the year un review they had not suffered from any stoppage conseq upon labour disputes, and the output showed some incre although it was considerably below that for the year 19 both in volume and value. The trading profit was £107 as compared with £90,313, or an increase of approxim £17,600. General establishment charges at £54,731 w somewhat higher than in the previous year, chiefly on count of the increase in reserve for taxation. Repairs renewals amounted to £2,891, as compared with £3,79 the previous year. There was a considerable reduction the charge in respect of interest on five-year notes and mortgage debenture stock, as compared with the amo charged in the previous year, the total being £3,160 as aga £5,278, or a reduction of approximately £2,100. They h charged against the profits of the year the whole of the e penses of the scheme of arrangement carried through at end of last year, which amounted to £2,041. They had debited against the profits of the year the usual allocation respect of depreciation, namely, £10,000. With regard meters—the chief department of the company's business—th had had an increased turnover during the year in quantity value, notwithstanding that prices had been reduced in c tain cases in sympathy with lower costs, and to meet forei competition. The new a.c. meter design for export mark was finding a ready and increasing sale. In this country th sales had also been satisfactory, and the business in d.c. well as a.c. meters had continued good. Their research depa ment was well advanced with the new type of d.c. met but it would, of course, take some further time before th was definitely put upon the market, as the testing of typ and improvements was a matter which required both ca and time. The transformer department suffered during th year in consequence of want of orders, and the output w below that of the previous year. The prospects for this ye were, however, better. They expected considerable increase business when the railway electrification and other pow development schemes, both at home and abroad, were active proceeded with. The instrument department showed signs improvement. The output was steadily increasing, and th hoped and believed that that would continue. The resul shown by the foundry department were satisfactory, a there had been an encouraging increase during the year output in iron, brass and "no-mag" castings. The financ position of the company had shown further substantial im provement during the year. There had been no additions land and buildings, or to cottage property, the figures remai ing the same. The capital expenditure on plant, machine and tools during the year amounted to £2,651. Goodwill a patent rights remained at the nominal figure of £1; whi investments showed an increase of £4,316, largely composed an increase in their holding in the Ferranti Meter and Tran former Manufacturing Co., of Canada. That subsidiary com pany seemed to be now well-established, and recent figure received from Canada showed encouraging progress. Stock and stores and work in progress showed a decrease of a proximately £21,000, which was due largely to stricter supe vision at the works. Sundry debtors and debit balances show an increase of approximately £28,500, which was due to th increased turnover of the business. Cash at bank and hand, and war loan at cost showed an increase of £9,232. The had invested some of their surplus funds, as they were n at the moment required, in Government securities, whi would enable them to earn a reasonable rate of interest. (the liabilities side of the balance sheet, the nominal capit had been increased to £300,000, and the subscribed capit increased from £123,374 to £206,166, in consequen of the scheme of arrangement. First mortgage debenture sto showed a substantial decrease of £8,649, represented by th amount of stock redeemed during the year. The small balan of £4,500 five-year notes, which appeared in the balance she at June 30th, 1922, was duly repaid at the end of that yea and in consequence disappeared from the balance sheet. Th depreciation reserve, in consequence of the increase of £10,0 debited against the trading of the year, stood at the substanti figure of £66,912. Sundry creditors were £112,040, as com pared with £106,088 in the previous year. They had tra ferred to the general reserve account from the balance profit and loss the sum of £20,161, increasing the amount that account to £90,000. The progress which the compan had made in recent years, and what had been accomplish in that time, were matters for congratulation. They had be able to deal satisfactorily with the whole of the arrears the 6 per cent. cumulative preference shares, and to compe sate the holders of the 7 per cent. second preference shares having waited so long, and they were now in the happy po tion of not only paying the dividend on both classes of prefe ence shares for the year, but also of declaring a substanti

dividend on the ordinary share capital. The reduction of indebtedness which had taken place over the last few years had been substantial, and the only mortgage indebtedness of the company now outstanding amounted to £54,020. That was being gradually reduced, and he hoped that before very long that item would disappear altogether. He did not propose to make any forecast with regard to the current financial year, except to say that the orders received up to date, and the output of the works were encouraging, and, although there was considerable trade depression, and business in the export markets was extremely difficult, they were hopeful that they might be able to present an equally satisfactory account next year, unless unforeseen difficulties arose in consequence of the present disturbed condition of affairs in Europe.

Dr. S. Z. de Ferranti seconded the motion, which was carried.

South Wales Electrical Power Distribution Co.

The preference shareholders in this company have received a circular explaining the advantages which will follow the adoption of the proposed agreement between the South Wales Power Co., Ltd., and the Distribution Co. The former will be constituted a holding company, and the administration of the undertaking will be vested in the Distribution Co. The consent of 85 per cent. of the preference and ordinary holders must be obtained for the exchange of their existing holdings on terms which are published in the *Financier* for October 23rd. Capital will become available for new plant and other developments. A 15,000-kW set has lately been installed, but another similar set has had to be ordered for early delivery. It is proposed to extend the main transmission lines into fresh areas where there are large additional power demands.

International Light and Power Co., Ltd.

Mr. Follett Holt, M.Inst.C.E., president, took the chair at a meeting of shareholders held at Cloak Lane, E.C., on Monday, the gathering being held, as usual, previous to the annual general meeting in Canada. In referring to the properties owned by the company, the chairman said that the Caracas undertaking maintained its position as the most prosperous and the most promising of their enterprises. Looking back over a period of nearly ten years, it was a matter of great satisfaction to note that net earnings had trebled since 1914, and that each year, even during the war period, showed an improvement over its predecessor. For the fifth year in succession the report referred to the withholding of the Mérida Co.'s cash deposits with the Reguladora, a Government institution in the State of Yucatan. It was becoming increasingly difficult to speak with restraint of the grave responsibilities of a State, laying claim to recognition as a civilised community, which indulged in acts of dishonesty such as in any other country would land the perpetrators in the courts, but seemed to pass with perfect impunity in the State of Yucatan. No moratorium decrees, no sham reorganisation of the guilty institution, no specious arguments regarding its status as a private concern, could conceal the fact that the highest public authority in the State, after monopolising exchange transactions, and accepting large deposits from private individuals and companies with a view to conversion into foreign currency, declared itself unable to refund the monies so deposited. Even in Mexico there was a limit to what might be excused as the inevitable outcome of economic depression and revolutionary disturbances, and unless the authorities woke up to a more accurate understanding of their responsibility, it was to be feared that the country's need of foreign capital for the development of her resources might remain unsatisfied for some considerable time. In Paraná, Argentine, the year had been uneventful, but on the whole encouraging. The tramways operated satisfactorily, and an increase of traffic was anticipated as soon as the additional line now in course of construction was completed. He was able to say that the company seemed to have turned the corner, and that its cash position was such that the directors confidently looked forward to the possibility of making a commencement with the payment of accrued arrears of dividend early in 1924.

Montevideo Telephone Co., Ltd.

The accounts for the year ending July 31st show that, after providing for all charges in Montevideo and London and making provision for income tax and corporation profits tax, the net profit amounts to £17,182. The interim dividend paid in May last absorbed £4,342, leaving a balance of £12,839, plus £13,782 brought forward, making £26,621. After transferring £10,000 to reserve fund, the directors recommend the payment of a final dividend of 3 per cent., making, with the interim dividend already paid, 5 per cent. for the year, less tax, leaving £10,107 to be carried forward. The working expenses in Montevideo amount to £102,276, compared with £80,732 for the previous year. At the last meeting of the shareholders the *ad referendum* agreement entered into with the Postmaster-General on June 30th, 1922, for the sale of the company's undertaking in Uruguay was ratified and the company was advised that the matter was thereby legally concluded. The Postmaster-General, however, refused to sign the definitive contract, on the grounds that the available profits of the company had been materially reduced by granting the increases in wages demanded by the strikers, the payment of which had been unnecessarily forced upon the company by a Government Decree. The directors are not able to forecast what the results of an appeal may be, although the moral claims of the company to have the agreement carried out cannot be disputed.—*Financier.*

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

East African Power and Lighting Co.—70,000 ordinary shares of 20s. each, fully paid, Nos. 1 to 70,000; and 200,000 new ordinary shares of 20s. each, issued at £1, partly paid and fully paid, Nos. 70,001 to 270,000.

The undermentioned have been ordered to be officially quoted:—

English Electric.—283,767 6 per cent. cumulative preference shares of £1 each, fully paid (Nos. 698,565 to 982,331).

Application has been made to the Committee to allow the following to be officially quoted:—

English Electric Co.—£1,303,192 6 per cent. convertible debenture stock.

Austria.—The report of the Aktiengeselischaft Kraftwerk Laufenburg showed a larger output of energy for the year owing to the greater flow of the Rhine, the production having been 314 million kWh, against 267 million in the preceding year. During the year the distribution network had been enlarged by the addition of a 52-kW, 50,000-volt line between Laufenburg and Zollhaus. Gross profits amounted to 3.8 million fr. and net profits 1 million, from which a dividend of 6 per cent. to the priority shares and 4 per cent. to the original shares was distributed, contrasted with 6 per cent. to both classes last year.

Barcelona Traction, Light, and Power Co.—As the half-yearly revenue justifies an increase of ¼ per cent. in the half-yearly interest payment due on December 1st next on the first mortgage bonds, the committee for the bondholders has approved the payment of 1¼ per cent. for the half-year.

Oriental Telephone & Electric Co., Ltd.—Interim dividends of 3¼ per cent. on the old fully paid 7 per cent. cumulative preference shares for the current year, less income tax, and 4 per cent. on the old fully paid ordinary shares, free of income tax.

Babcock & Wilcox, Ltd.—Interim dividend of 5 per cent., free of tax. The interim payment a year ago was 8 per cent., but the present distribution is equal to 10 per cent., the ordinary share capital having been doubled by the capitalisation of reserves.

Calcutta Tramways Co., Ltd.—The directors announce an interim dividend of 2½ per cent., free of tax, on the ordinary shares on account of the profits for 1923. The £5 ordinary and preference shares are to be split into ordinary and preference shares of £1 each.

Kaministiquia Power Co.—A bonus has been declared of one share of Kakabeka Securities Co. for each share of Kaministiquia Power Co. A quarterly dividend of 2 per cent. has also been declared.

Cowlishaw, Walker & Co., Ltd.—According to a financial contemporary, the accounts to March 31st show net loss, after charging £7,000 for depreciation, of £15,898, increasing the debit balance to £31,945.

Herbert Morris, Ltd.—Total dividend of 10 per cent., free of tax, on the ordinary shares; £10,000 to reserve; £29,736 carried forward.

Brampton Bros., Ltd.—Dividend of 10 per cent., free of tax, on the ordinary shares; £5,000 to reserve; £11,222 carried forward.

Richardsons, Westgarth & Co., Ltd.—An interim dividend of 6 per cent. actual is announced.

STOCKS AND SHARES.

Tuesday Evening.

From the manner in which new issues are making their appearance, it is obvious that borrowers regard the present time as opportune for appealing to the public for substantial sums of money. There have been nearly half-a-dozen prospectuses out just lately, offering in each case well over a million pounds' stock for public subscription, and there has been no difficulty in underwriting any of them. The manner in which these stocks are absorbed illustrates the readiness with which stock can be placed, because the issuing houses would not attempt such large operations unless they felt tolerably confident of a hearty reception from the public. Nevertheless, all the money which is going into new issues has little effect upon existing securities. Prices are more affected by the foreign exchange *débâcle*. After showing robust strength, a fairly general reaction has occurred amongst investment and speculative markets alike.

Metropolitans spurted to 79¼, but came back to 78, and Districts, after being 57½, fell back to 56. Underground ordinary shares of £10 each are 5s. down; the 1s. shares and the in-

come bonds show no changes on balance. The explanation of the speculative demand is still to be found in the hope that the Metropolitan Railway and the District will be taken over by one of the bigger brethren at prices eminently satisfactory to holders of the two former. For the rise in Underground Electric Railway stocks, the explanation continues to be that a scheme of reorganisation is expected to be made public before long. A good deal of speculation is taking place in the lower-priced varieties, and the market is sensitive to outside influences that govern the tone of Stock Exchange markets as a whole. Speculative fancy has noticed East London ordinary, and from 5 the price rose to 5¼, carrying with it the prices of the company's debenture stocks. There is no harm in mentioning, we hope, the fact that negotiations have been in progress for some time past between the East London and one or two of the guaranteeing companies with the object of putting East London on to a firmer basis. That something of this sort will be accomplished sooner or later has been, of course, a matter of anticipation for years past, and spasmodic rises in the stock have occurred when rumour played with the idea that such negotiations were likely to materialise into something definite. Hitherto, however, nothing has been done, and the stockholders have had to rely upon dividends drawn upon the Bank of Hope.

Notwithstanding the high prices to which most of the electricity supply companies' shares have now attained, there is still a steady inquiry for the leading shares. It may be that the investment appetite is a little less acute now that quotations have moved on to levels at which the return on the money is comparatively modest for ordinary shares. A few people are undoubtedly taking advantage of the current level of prices to sell, for many of the present proprietors can secure very handsome profits upon their purchase prices. The difficulty is, of course, to know what to do with the money if shares are realised, and those who bought cheaply are receiving handsome yields on their investments, with the prospect of these returns certainly not being less in the near future, hopefulness looking, indeed, for an improvement in respect of the current twelve months.

Edmundson's ordinary at 4¼ are 7s. 6d. up. Westminsters are 5s. higher; St. James' put on 2s. 6d. Folkestones are 5¾, showing a 5s. gain. City of London second preference rose to 30s.

Calcutta Trams are good at 4¼. Kaministiqua shares at 135¼ are 6 points higher. Potteries preference came into request, and went up to 10s.

General Electrics keep a good tone, being again harder at 19s. 6d. India Rubbers strengthened to half-a-guinea. Edisons slid back to 4s. 9d. Callender's at 2 7/16 are 1/16 better, and Henley's hold their last week's gain at 48s. Activity in Whitehall Electric debenture lifted the price to 96½, the preference remaining at 20s. Siemens keep close to 13s. 9d. Victoria Falls ordinary advanced to 30s., and the preference are steady at 29s.

Mexican issues move disappointingly from the viewpoint of stockholders. France has now afforded official recognition to General Obregon's government, and Great Britain is declared to be on the eve of so doing. Yet the prices of Mexican stocks—Government, railway and utility—are depressed. Mexican Light & Power firsts stand out as an exception, with a gain of 2 points, but the rest in this group continue weak. Brazil Tractions shed a point, going back to 46; the preferred advanced to 94. Tokio Electric sixes have further recovered to 89, equal to 5 discount on the issue price of 94. Reference has already been made here to the reassuring news received from the company in regard to the amount of damage wrought by the recent earthquake. British Columbia Electric Railway stocks are tolerably steady. No changes, apart from that in Potteries preference, occurred in the list of British traction stocks and shares.

The speech of the Postmaster-General, made a few days back, to the Imperial Conference on the subject of an Empire chain, led to no further developments in the Marconi market. The speech itself could hardly have been more guarded had it fallen from the lips of the Eastern Telegraph Company's Chairman. Cable stocks are firm. Globe ordinary, with a rise to 18, now stand the highest in their quartette. Anglo-American preferred at 102 is ex the quarterly 30s. dividend. Anglo-Portuguese Telephone shares changed hands on Monday at 5s. 9d; Venezuela Telephones were dealt in the other day at 6s. 6d., and the 5 per cent. mortgage debentures at 50¾. Marconis are unchanged at 46s. 3d., and Canadian Marconis at 7s. 6d. Radio Common at 12s. 6d. and the preferred at 15s. 6d. lean to the dull side.

Babcock & Wilcox are a good market, with 1/16 rise to 2 5/16, on the declaration of a 5 per cent. interim dividend. This goes against 8 per cent. a year ago, when the ordinary share capital was half its present amount. Metropolitan-Vickers retain their last week's rise of half-a-crown. Engineering, iron, coal and similar shares are generally better, on the Government programme for unemployment work. It is worth noticing that people are showing discrimination in this respect; the non-dividend-paying shares are less in demand than others in the companies which afford a return on the money. Vickers have been up to 14s., to react a trifle as shares came in from the north. The rubber share market remains dull and inanimate.

SHARE LIST OF ELECTRICAL COMPANIES

Home Electricity Companies.

	Nom.	Dividend. 1921.	Dividend. 1922.	Price Oct. 23, 1923.	Rise or fall.	Yield
	£					
Brompton Ordinary	1	12	12	2¾	– 1/16	£5 16
Charing Cross Ordinary	5	9	14	13	+ ½	5 7
do. do. do. 4½ Pref.	5	4½	4½	4½	–	5 6
Chelsea	1	6	10	38/-	–	5 5
City of London	1	14	15	2 7/16	–	5 17
do. do. 6 % Pref. ...	1	6	6	24/-	–	5 4
County of London	1	8	10	2 5/8	–	4 16
do. do. 6 % Pref. ...	1	6	6	23/3	–	5 3
Edmundson's Ordinary	5	Nil	7	4½	+ ¾	5 2
do, 6 % Pref	5	12/-	6	5	–	6 0
Kensington Ordinary	5	10	12	10½	–	5 14
London Electric	3	4	10	5	–	5 10
do. do. 6 % Pref. ...	5	6	6	5½	+ ½	5 11
Metropolitan	1	7	8½	1½	–	4 17
do. 4½ % Pref.	1	4½	4½	17/-	–	5 6
Newcastle-on-Tyne Ordinary ...	1	Nil	2½	16/3	–	3 1
do. 5 % Pref. ...	1	5	5	15/9	–	6 7
do. 7 % Pref. ...	1	7	7	24/-	–	6 1
Notting Hill 6 % Pref.	10	6	6	9½	–	6 6
North Met. Elec. 6 % Pref. ...	1	6	6	22/-	–	5 9
Urban Ordinary	1	Nil	—	16/3	—	Nil
do. 5 % Pref. ...	1	3½	5	⅝ xd	+6d.	6 17
James' and Pall Mall ...	5	12	14½	11¾	+ ½	6 2
South London	1	7	10	1 1/16	–	5 0
South Metropolitan Pref- ...	1	7	7	24/6	–	5 14
Westminster Ordinary	5	10	12	10½	+ ½	5 14
Whitehall Elec. Invst., 7½ % Pf.	1	7½	7½	1	–	7 10

Home Rails.

Central London Ord. Assented	Stock	4	4	73	–	5 9
Metropolitan	,,	2½	3½	78	–	4 9
do. District	,,	1	3	56	+1	5 7
Underground Electric Ordinary	10	Nil	Nil	8¾	+ ¼	Nil
do. do. "A" ...	1	Nil	Nil	10/6	—	Nil
do. do. Income	Bonds	4	5	101	—	*4 19

Telegraphs and Telephones.

Anglo-Am. Tel. Pref.	Stock	6	6	102xd	–	5 17
do. Def.	,,	1½	34/6	23	–	6 9
Chile Telephone	5	6	6	6	–	5 0
Cuba Sub. Ord.	10	7	7	7½	–	9 13
Eastern Extension	10	10	10	17½	–	5 14
Eastern Tel. Ord.	Stock	10	10	175½	–	5 14
Globe Tel. and T. Ord.	10	10	10	18	+ ½	5 11
do. do. Pref.	10	6	6	11½	–	5 7
Great Northern Tel.	10	24	22	27½	–	8 0
Indo-European	25	10	7	32½xd	+10/-	*5 7
Marconi	1	25	15	2 7/8	–	6 9
Oriental Telephone Ord. ...	1	12	12	1½	–	*6 8
United R. Plate Tel.	5	8	8	7	–	*5 14
West India and Panama ...	10	Nil	Nil	1/6	–	Nil
Western Telegraph	10	10	10	17½	–	*5 14

Home and Foreign Trams, &c.

Anglo-Arg. Trams. First Pref.	5	5½	12½	2 1/16	–	9 7
do. do. 2nd Pref.	5	Nil	5½	2 5/8	–	11 17
do. do. 5% Deb.	Stock	5	5	76½	–	6 10
British Electric Traction Ord.	,,	4½	5	74½	–	6 14
do. do. 6% Pref.	,,	6	6	101½	–	5 18
Brazil Tractions	100	Nil	4	46	–1	8 14
Brit. Columbia Elec. Rly. Pcs.	Stock	5	5	87½	–	5 14
do. do. Preferred	,,	5	96/-	84½	– ½	*5 14
do. do. Deferred	,,	5	127/-	96½	–1	*6 11
do. do. Deb. ...	,,	4½	4½	79½	–	5 7
Lond. & Sub. Trac. 5 % Pref.	1	9½	5	9/-	–	11 9
London United Tram. Deb. ...	Stock	4	4	60	–	6 13
Mexico Trams. 5 % Bonds ...	—	Nil	Nil	76½	–2	6 10
do. 6 % Bonds ...	—	Nil	Nil	55½	—	Nil
Mexican Light Common ...	100	Nil	Nil	24	–	Nil
do. Pref.	100	Nil	Nil	53½	–1	Nil
do. 1st Bonds ...	—	Nil	5	68½	+2	7 6

Manufacturing Companies.

Babcock & Wilcox	1	15	20	2 5/16	+ 1/16	*4 6
British Aluminium Ord. ...	1	10	5	18/3	–	5 9
British Insulated Ord.	1	15	15	9½	–	6 6
Callenders	1	15	15	2 7/8	+ 1/16	6 3
do. 6% Pref.	1	6½	6½	25/-	–	5 4
Crompton Ord.	1	10	5	½	–	10 0
Edison-Swan	1	10	Nil	4/9	–3d.	Nil
do. do. 5% Deb.	Stock	5	5	65	–	7 13
Electric Construction	1	10	10	1½	–	6 13
English Electric	1	5	5	17/3	–	5 16
do. do. Pref.	1	6	6	19/-	–	6 6
Gen. Elec. Pref.	1	6½	6½	23/-	–	5 13
do. Ord.	1	10	5	19/6	+9d.	5 2
Henley	1	15	15	48/-	—	6 5
do. 4½ Pref.	5	4½	4½	4½	– ¼	5 0
India-Rubber	1	10	—	10/6	+6d.	—
Met.-Vickers Pref.	2	8	8	2½	–	6 8
Siemens Ord.	1	10	10	1½	—	Nil
Telegraph Con.	12	20	20	25	–	*5 0

* Dividends paid free of Income Tax.

BRITISH INTERESTS IN BRAZIL.

A MEMORANDUM concerning United Kingdom and Imperial interests in Brazilian trade and enterprises has been prepared by the British Chamber of Commerce in Brazil with a view to its consideration at the Imperial Economic Conference. The Chamber, while feeling that British trade with Brazil is capable of very important expansion, expresses the hope that a suitable tariff arrangement may be arrived at in order that more favourable conditions for its natural expansion may be secured. It may be remarked, however, that it is doubtful whether the subject of an Anglo-Brazilian commercial treaty is likely to be given much time or consideration at the Imperial economic conference. What the Brazilians naturally want is more markets for their products, particularly for their coffee.

In its memorandum the Chamber points out that Brazil has been opened up by railways, river services, ports and other works, to a much greater extent than is generally recognised. Further on it notes that Britain has invested several hundred millions sterling in public loans, railways, &c.

The Two Views.

With complete frankness the Chamber puts forward both the Brazilian and the British view:—

"The Brazilians want capital and enterprise to come in .... But they do not want to see foreign capital and enterprise reaping large profits in Brazil, to be remitted to the foreign countries who furnish the capital and the enterprise."

On the other hand, it is stated that whenever those by whom Brazilian policy is shaped realise that profitable return to foreigners on the capital and enterprise they furnish is the only way to turn Brazil's potential wealth into actual prosperity, then Brazil will be developed rapidly, and capital, enterprise, and labour will pour into Brazil. The profits remitted to the home countries will be adequate, but as nothing compared with the money sent to Brazil by way of investment.

The memorandum proceeds to refer to the difficulties which British investors have at times experienced in Brazil and the unsatisfactory restrictions to which British banks and insurance companies have been subjected there.

American Penetration.

With regard to the machinery, engineering, and contracting industries, it is pointed out that the British supplies of electrical machinery and materials are very small, the United States being the chief supplier. An American company has established in Brazil the manufacture of electric lamps and this "national" industry, which is calculated to supply the whole consumption in Brazil, and possibly in time to export to other South American countries, bids fair to secure the monopoly of this article.

An almost incredible feature in Brazilian railways is that although British enterprise and British capital have entered so largely into their early history, and still take an important place, and although Great Britain has led in railway affairs all over the world, Great Britain is almost out of the market in the supply of railway materials except for the British companies. From rails to rolling stock the imported material comes from the United States, France, Belgium, Germany, Switzerland, &c., and now that electrification is likely to come about by the harnessing of Brazilian water power, competition must become keener. Whatever the reason may be why British industry is not maintaining its place abroad in the supply of railway materials suitable to countries where they are required, there can be little doubt that a Government like that of Brazil must be influenced in its treatment of British railway concerns by the fact that the Federal and State railways obtain better terms and presumably more suitable articles from other countries.

There is no obvious reason why British railway contractors should not succeed in meeting the competition referred to. They are under no inferiority to American competitors, for example, that cannot be overcome. It may not suit British manufacturers at present either to tie up capital or to enter into a price campaign with competitors, but the closest technical study of Brazilian railways and their requirements should be carried on continuously and every opportunity should be taken to regain lost ground. The quality of British material is never in doubt and there is no unwillingness to transact business with British firms. It is simply a matter of prices, terms, and suitability of material. An enterprising supplier might refit an entire system if he could show it would be profitable in the end to do so. But he would require to arrange to finance the work.

For the purpose of showing the progress which has been made at our expense by competing countries the memorandum gives certain statistics of import trade. Those relating to the electrical trades are given below. They are not complete but serve to show the general trend of import trade:—

Brazil's Imports of Electrical Goods.

	1921. Contos (£34 10s.)	1922. Contos (£29 10s.)
Light and power machinery.—		
Total	22,779	19,622
From Great Britain	4,106	4,107
,, United States	*	9,530
Carbons.—		
Total	304	*
From Great Britain	105	59
,, United States	*	192
Dynamos and generators.—		
Total	4,167	*
From Great Britain	539	684
,, United States	*	1,121
Lamps.—		
Total	5,902	*
From Great Britain	235	211
,, Germany	*	2,232
Motors.—		
Total	8,997	*
From Great Britain	810	1,191
,, Germany	*	1,964
Transformers.—		
Total	4,228	*
From Great Britain	126	304
,, United States	*	1,317
Bare copper wire.—		
Total	350	*
From Great Britain	119	603
,, United States	*	789
Insulated copper wire.—		
Total	3,876	*
From Great Britain	106	545
,, United States	*	1,699
Electric cables.—		
Total	7,689	*
From Great Britain	1,298	898
,, United States	*	2,211

*Figures not available.

Technical Representatives.

The Chamber's committee considers that British houses should secure a much larger share of engineering contracts, electrical and hydraulic installations, and corresponding supplies, including machinery, railway materials and metal goods generally. It considers that the general representation of leading British concerns has often been defective on two points, *viz.*, technical equipment and financial resources. There should be a technical representative thoroughly competent to handle business. Such a technical man could do the work for a group of engineering and contracting firms. This does not imply that they should not have the services of local agents in Brazil, whose local knowledge and commercial services are of the greatest value.

Financing of Contracts.

On the financial side it is impossible for local agents of whatever standing to take the responsibility of advances on a large scale, spreading payments over two or three years, however sound the contract business may be in itself. The financial arrangements may also be unsuitable for the contractors, and it has been suggested that such sound finance business might be undertaken by a British commercial financing institution specially equipped for the purpose. This would require careful local investigation, but business could be done safely and profitably on such lines and greatly to the advantage of British trade. The credits involved are often too long to be attractive to bankers but do not necessarily imply undue risk. The principle suggested for such financing business is on the lines of the Trades Facilities measures for moderate amounts, but what is required is more of the nature of credits repayable by instalments.

General Representation.

In the opening up of such representations as may be considered on both sides to afford the prospect of good business the United Kingdom firms should, says the memorandum, be prepared:—

(1) To guarantee a minimum annual return to the local representative varying with the nature of the proposal. From £300 to £500 is about the minimum worth consideration. (2) If stocks of goods are to be formed they should be placed, freights and duties paid, into the local agents' warehouses to be paid for on sale.

No considerable local house, it is added, will take up any new representation involving outlay and trouble simply on the reputation of the manufacturers and some probability of sale of the goods. The manufacturer is liable to over-estimate

the saleability of his article and to think that it will "sell itself" on its reputation. If it is not already well in the market it will not sell itself, but will probably have to make its qualities known against competing articles, possibly inferior, but whose name has become familiar to buyers and dealers.

There are too few of the chief British exporters well represented in Brazil. There is room for more, but the newcomers must make up their minds to pay for good representation and facilitate sales by creating stocks where required and generally supporting the efforts of the house representing them.

TRADE FLUCTUATIONS.

There are few more important, and may we add few more difficult, subjects for the British industrial nation than trade fluctuations, their causes, adverse influence, and the possibility of minimising, if not preventing them. Neither booms nor depressions enable us to produce the best results for either employed or employer, and if the trade curve could be free from falls and be continually gradually rising in keeping with the progress of world development and population we should live in a far less worrying and turbulent state. But such a subject is cut across by so many factors and there are constantly varying conditions arising which promote the rise of some trades and the fall of others simultaneously, that nobody in his senses contemplates the approach of world steadiness or lack of fluctuations. Yet because we cannot reach what some would regard as an ideal industrial or trade state we are not to be excused from bringing the deepest thought we possess to bear upon the problem for the purpose, if possible, of reducing the adverse effects.

One of the first things that can be undertaken is to conduct expert investigation into the causes of fluctuations, as no remedy can be applied until after an expert diagnosis has been made, and perhaps not even then. The world war brought to all industrial peoples the greatest boom on earth, but it was not a boom of the kind to which present-day traders were accustomed. That boom, owing to many causes, has been followed by the deepest depression in the trade curve of many industries in certain countries, though some nations still continue to "enjoy" boom conditions. Unfortunately it is not possible to approach the present situation as though it were the development of normal conditions—the war and its effects cannot be ignored, but we may leave it out of mind as much as we can for the purpose of such an excellent inquiry as the Federation of British Industries is now conducting with a view to finding out how to forecast trade conditions.

Of course one cannot forecast anything with absolute certainty where natural forces may play havoc, as they have done in Japan. The Japanese disaster is an exceptional one, but note how a prosperous people, who made money during the war, when other nations were obliged to spend it extravagantly, have now to repay much of their war-made wealth to those other nations in order that they may repair the colossal damage. The calamity creates an opportunity for some of our industries in their period of slump; insurance interests in the City feel the losses especially just now of ships that disappeared in the tidal wave, but before long our shipbuilding industries, now in an unprecedented slough of despond, will profit by the ordering of vessels to replace the losses.

A financial panic in the United States some years before the war came in as an unforeseeable factor and sent out its influence with lightning speed around the entire globe, the industrial country which was the last to feel the effects being Germany. The spread of Bolshevism in Russia broke in pieces the rising edifice of industrialism and crumbled into red-stained dust the vast trade of the old Empire. Could analysis of trade fluctuation factors have foreseen that? The state of Europe at the present moment is the aftermath of war—the prophets amongst us did not predict this! It was the fashion rather to dwell with satisfaction upon the immense requirements of the essential work of reconstruction and the need for replenishing throughout the world-markets the vast stocks of products of which the war had deprived them for so long.

When, therefore, we endeavour to discover what are the factors likely to enable us to forecast trade conditions, we must go back to the years preceding the war, though it is impossible to free our thought, for practical present-day purposes at any rate, from war and other exceptional disasters. The Federation of British Industries, which is to be congratulated upon its very thorough effort to deal with the subject, has taken into account what happened during the period 1898 to 1913. It started out with the fact that trade in the past had been subject to violent fluctuations, that periods of boom and of depression had alternated with each other to the detriment of the peaceful progress of industry, and by means of an elaborate research it has been shown that the conditions underlying these fluctuations can, to a large extent, be determined. It is believed that by studying these conditions over a period of years the directing heads of business may be assisted in shaping their future policy so as to make provision in advance and avoid the exaggerated r and falls in trade activity. In the issue of its *Bulletin* October 10th it published an article briefly explaining theory of the trade cycle, illustrated by graphs showing

(*a*) The fluctuations in bank credit, bank rate, pric &c., during the period 1898 to 1913—a period of gene expansion in home and foreign trade.

(*b*) Post-war business conditions.

In addition, articles were published explaining the gra and an attempt was made to forecast according to the ind tions in the post-war curves, whether or not a substant improvement was in sight. It is proposed to publish in *Bulletin* once a quarter a similar economic section wi graphs illustrating the trade cycle. We must refer readers to the original contribution if they wish to follow method of the investigation; but we may give here closing sentences, in which an attempt is made to forecast future:—

"The amount of bank money which the banks are allowed provide is shown by the deposits curve, and the amount is shown by the advances. Since the banks are only able lend with safety between 40 per cent. and 50 per cent. of the deposits, the relative movements of the advances and depos curves indicate that the maximum which the banks can le under present conditions is being reached. This mean therefore, that an increase in trade depends on a further fa in prices. Since, however, the placing of orders and repl ishment of stocks by merchants is encouraged by a rise i prices and discouraged by a fall, we find it impossible to pr dict any substantial improvement in trade during the comi months, despite the favourable indications of the oth curves. At the moment monetary conditions appear to b determined by two conflicting policies: (1) the protection the dollar sterling exchange; and the other (2) prevention a further fall in prices in this country. If the former poli prevails, then in the absence of a rise in prices in Americ it must not only necessitate a further fall in prices in th country, but, owing to the effect on the exchange, make more difficult for foreigners to buy our goods.

This is all very informative and useful, but one has to bea in mind that these basal conditions cannot allow us to ignor the influences which personal initiative and changing policy ca exercise. For instance, there is unlimited scope for electrica development practically everywhere, and the sheer necessity for the world to advance along electrical lines in order t secure efficiency, economy and progress, lessen in the electrica world the importance of some of the factors which affect othe departments of activity. Then the schemes of Governments for making work to lessen unemployment, by anticipating de velopments that would have taken place, under normal cir cumstances, at a later date, has both its immediate and it future consequences. The adoption or rejection of preferen tial trading on substantial lines between the Mother Country and the other parts of the British Empire will be bound t affect the future trade course; then the effects of foreign com petition have to be reckoned with; and last, but not least, one may mention the export trade initiative and enterprise—the spirit of adventure, if we please to call it so—of our own and other nations. In short, if we take proper advantage of all the legitimate means for assisting electrical development at home and abroad and put forth full endeavours for securing work; if we can produce our goods cheaply enough and with reasonable originality; if we can depend upon the relations of employers and employed becoming more peaceful; if we safeguard ourselves against unfair external competition; we can do something to prevent British electrical and allied engineering industries from suffering so seriously as other industries from serious trade fluctuations for many years to come.

The International Conference on Large Electrical Networks at very High Pressure.—The satisfactory results of the conference held in 1921 led to the establishment of the secretarial staff and office on a permanent basis. The second conference will be held in Paris from November 26th to December 1st, and will embrace the following subjects: The construction of lines for very high pressures; the study of insulators; the construction and operation of outdoor stations; the standardisation of pressures; international technical regulations for e.h.p. lines; and the organisation of publicity service to make known the atendant risks. Other matters can also be broached.

Those who wish to submit reports should communicate with the general secretary of the conference and send him their manuscripts, as soon as possible, in order that they may be translated and printed in time for distribution before the conference begins.

The conference is composed mainly of delegates from the principal electrical societies of each country and from the National Electrotechnical Committees of the International Electrotechnical Commission, but it will be open to all persons who wish to attend it, whether delegates or not. In 1921 there were 53 delegates and more than 200 others present. The address of the secretary is 25, Boulevard Malesherbes Paris.

THE PAVILION, SHEPHERD'S BUSH.

Among the many dependents of electricity which have developed so rapidly in the last decade or two must be mentioned kinematography. From its beginnings in unsuitable halls and shed-like structures it has advanced at a wonderful pace, until to-day many kinemas rank with the finest buildings of the present age.

An excellent example of this is the "Pavilion," Shepherd's Bush Green, W., which was designed by Mr. Frank Verity, A.R.I.B.A. In general scheme this bears a strong resemblance to a Roman temple; it is of the most ample proportions, and the decoration, though lavish, is in the choicest of styles.

It is the electrical equipment, however, with which we are most concerned. While the theatre cannot be said to be "all-electrical," it approaches this ideal, as the following description will show.

The management is fortunate in having a duplicate supply, so that in the event of a breakdown on one system the installation, which normally requires about 250 kW, can be immediately switched over to the other. It was the original intention to install a private generating plant, but the terms offered by the Hammersmith Borough Council were so generous that this was rendered unnecessary. The alternative supply comes from Kensington. The Hammersmith supply is single-phase, 50-cycle current at 6,000 volts, and this is transformed down to 230 volts for general illumination, &c. For a number of special purposes, including the feeding of the projector arcs, direct current is used, and this is provided by Siemens - Schuckert 20-kW motor - generators, in duplicate, which give an 80-volt supply. These were supplied by Messrs. Cordingley and Mills, and consist of four-pole, 230 - volt, single-phase, slip-ring, induction motors, with short-circuited rotors, running at 950 r.p.m., and driving compound-wound generators. In the motor-generator room is the main control board, the principal feature of which is the two large change-over switches for power and lighting, by means of which the installation is changed from one supply to the other. On this board also are time switches, arranged to act after a certain hour (after sunset) when another rate of charge comes into force. The same room contains a number of distribution and control boards for the decorative lighting, of which there is a great deal. In case of the failure of supply provision is made for the maintenance of sufficient illumination while changing-over is being effected by lamps on a totally-distinct circuit. All the wiring is in conduit and "Simplex" fittings are used throughout. The hidden cables are easily got at, the wiring being arranged on a central looping system. A special type of drawing-in box is installed, to facilitate the running of leads.

Fig. 1.—Part of Auditorium.

Ventilation is effected upon the plenum system, which ensures that there will always be a positive air pressure in the building. The plant consists of a Sturtevant fan driven by a 30-h.p. Parkinson single-phase commutator motor. The air is drawn from the top of the building, washed and heated, and distributed by ducts to all parts. The heating is by steam pipes fed from a Lancashire boiler working at 35-lb. pressure. For heating the vestibule, ante-rooms and exits a steam calorifier radiation system is installed. A central vacuum cleaner is fixed in the basement. This consists of a 12-h.p. Sturtevant turbine driven by a "Century" single-phase motor.

In the operating room are two Ross projectors, as well as spot lights. The projectors are fitted with a special new mirror arc and high-intensity carbons with a large core, giving a very white arc. The lenses are of special design, as, owing to the projector room being placed below the balcony instead of, as is usual, at the extreme rear of the hall, the "throw" is abnormally short—65 ft.—and the picture is 21 ft. wide. The lighting dimmer is of special design. It comprises ten "units," which can be switched into parallel to adjust them to a varying load. The contacts are mounted on threaded shafts headed by a gear wheel. These wheels engage with bevel wheels on the main operating shaft and the latter is driven by a .5-h.p. motor, or by hand if necessary. The dimmer motor is controlled from a board in the operating room. Beside each projector is a push-button control board, which operates the curtain-drawing gear upon the stage.

The stage lighting is similar to that found in an ordinary theatre. Provision is made for illuminating the screen with light of four different colours.

The exterior lighting is varied. There are two floodlights above the entrance, and these are flanked by 1,500-W lamps in amber glass covers. Further along the building are six decorative standards bearing gasfilled lamps. There are two signs; one consists of the word "Pavilion" outlined in neon tubing; the other is a letter sign which can be changed to announce the principal item of the programme.

The accompanying illustration (fig. 1), which is reproduced from the *Architectural Review*, shows a part of the auditorium, which seats about 3,500 people.

The main interior lighting is provided by lamps concealed behind large amber panels in the ceiling, and beneath the balcony are a number of auxiliary panels of octagonal shape. Beautiful colour changes are effected by lines of lamps fitted with coloured screens. The principal colours are white, red, green and blue, and many combinations of these can be obtained by controls in the wings of the stage to produce an "atmosphere" to conform with the film being exhibited. "Regulation" lighting is provided by Roman lamps, in which small lamps, obscured by a special dipping process developed by the General Electric Co., represent the flames. The gangways are illuminated by lamps concealed in cornices. Most of the lamps and special glassware was provided by the General Electric Co., Ltd. The actual installation was carried out by Mr. Basil Davis, the electrical engineer, who has had considerable experience, both in this country and America, in the design and installation of such lighting schemes. The ventilating and heating apparatus was installed by Messrs. Young, Austin and Young; telephones by the Sterling Telephone & Electric Co., Ltd.; switchboards and resistances by the Alliance Electrical Co., Ltd.; electric clocks by the Synchronome Co., Ltd.; a lift by the Express Lift Co., Ltd.; and the cables were supplied by Mr. J. S. Plumtree.

This description would be incomplete without mention of the organ, which, indeed, merits a separate article.

The electrical mechanisms in this organ are of two types. The stop-key tablets are reversed by means of ironclad double solenoids, one to each stop-key. Each circuit of this type takes about one ampere at 10 volts pressure; but as soon as the movement is completed the circuit is automatically broken and thus, although sometimes as many as forty circuits are simultaneously operated, there is no heavy continuous current consumption. The principal mechanisms of the organ are, however, electro-pneumatic, the electro-magnets serving only to move an exceedingly light armature in the form of an iron disk through a space of about 1/32 of an inch. These electro-magnets, of horseshoe form, are wound with 34 gauge wire to a resistance of 120 ohms, and their pole ends are sweated into non-ferrous castings which form the primary valve-seats of the pneumatic action. The tiny armature disk constitutes the primary pneumatic valve, which admits air at atmospheric pressure to the interior of a small pneumatic motor within the air-chest of the organ. There are four manual keyboards of 61 notes each, and a pedal keyboard of 32 notes. Each note of these (276 notes in all) closes a circuit operating a relay which in turn closes 27 other note circuits. In addi-

tion to these there are 127 circuits controlling the relay groups, 74 operating pistons and other stop controls, and 1,016 for the adjustable combination mechanism, making a total of 8,945 electrical circuits in the whole organ. The blowing apparatus consists of a "Discus" blower, belt-driven by a 15-h.p. Century motor. The 10-V supply for the organ-playing mechanism is supplied by a 400-W motor generator, with which is associated a 100-Ah storage battery. Most of the mechanisms in this organ have been patented by Mr. John Compton, and the organ was made by Messrs. John Compton, Ltd.

TECHNICAL STAFF COUNCILS.

A Statement Addressed to all British Staff Engineers.

The following statement is issued to-day by the Society of Technical Engineers, of which Mr. R. Hazleton is the secretary:—

A step of great importance to all engaged in the engineering profession was taken when, in the autumn of 1921, this Society, with the unanimous support of its members, claimed for the technical and administrative staffs of all firms engaged in the British engineering industries the right to a recognised place as the third party in those industries.

While maintaining a separate position distinct from employers and manual workers we recognised the duty of co-operating with both to the fullest extent for the advancement of industry. Staff engineers have serious responsibilities as a unit of management, while as employed professional men they must also keep in view the interests of their profession.

The work of our Society met with little encouragement at first from either employers or manual workers, both of whom seemed apprehensive lest recognition of the staffs as the third party might prejudice their own special rights or upset the existing balance between them.

In these circumstances we felt that not only must the suspicions of the two other parties be removed, but they must feel assured that the attainment of our objects would neither injuriously affect their particular interests nor those of the industry as a whole. Much patient effort has been expended on this task since 1921, and as a result we now have hopes that in the next stage of our work we shall not have to meet with suspicion or hostility from either employers or manual workers.

Staff Councils and Technical Committees.—We shall continue to pursue our settled policy, but have come to the conclusion that it would greatly help our work and effectively advance the interests of staffs and the efficiency of industry if staff councils were formed in every engineering firm where the size of the staff allows of this being done.

We have carefully considered whether to recommend the formation of councils representative of technical staffs alone, or of all other staff sections as well. Where other sections are willing to co-operate we think the councils should be representative of staffs as a whole, but in large firms we hope technical committees will also be formed.

We do not propose that such councils or committees should have any official association with our Society. Our aim is to help and advise in the formation of these bodies. In some of the larger firms staff committees, of somewhat more limited scope than those we suggest, have already been set up, and are working satisfactorily.

S.T.E. Programme.—The objects of our Society naturally fall under two heads: staff objects and industrial objects.

Staff Objects.—Among the staff objects which our Society has set before itself are the following:—

(*a*) The general adoption of a scheme of superannuation which will not tie its members to individual firms.
(*b*) Unemployment insurance and the establishment of an efficient employment bureau.
(*c*) The safeguarding of patent rights of inventors.
(*d*) The adjustment of inequalities in conditions of service and rates of pay.
(*e*) Such organisation of the engineering profession as will tend ultimately to secure the proper regulation of entry thereto, registration, and the recognition of the principle that only qualified technicians shall hold technical posts, while ensuring that proved ability will not be debarred from its rightful place because of the absence of academic degree.

Industrial Objects.—In addition to staff objects, such as those referred to, our Society has set before itself as a main object the advancement of the British engineering industries, and has pledged itself to keep this aim steadily in view in all its activities. This is one of our most important reasons for maintaining our third party position, so that we cannot be drawn into alliances which might prejudice this vital purpose. The formation of staff councils and technical committees within firms engaged in the engineering industries as outlined here may be taken as an example of one way in which we hope to promote our industrial objects.

The Councils and the above Objects.—It will be clear that both the staff councils and our Society will be striving simultaneously towards the attainment of the above objects. It may be that some of the objects must be left for bodies such as this Society to deal with, as, for instance, unemployment insurance, and an employment bureau which we already have in operation for our members. On the other hand, in addition to devoting attention to staff interests, we hope the councils and especially the technical committees, will assist the management in improving organisation, and put forward suggestions with regard to means of increasing efficiency in connection with such questions as:—

(*a*) Methods of improving processes or means of control in manufacture, including the reduction of costs otherwise than by the reduction of salaries or wages.
(*b*) The encouragement of invention by concentrating attention on particular problems, and by other means; and
(*c*) Inter-departmental organisation.

We believe that, in time, the management would look to these bodies for assistance in considering many other problems.

The Councils and Disputes.—It has been suggested that the Councils could do useful work in smoothing the wheels of industry where difficulties and disputes arise between employers and manual workers. We would like to think that this might be so, but in our opinion the Councils ought not to intervene in such cases without the direct invitation of both parties. Where staff interests are directly affected the Councils would, of course, make direct representations to the management.

Conclusion.—We hope to win for these proposals the support of all organisations representative of other staff sections as well as our own, and we shall earnestly seek their co-operation and do all we can to secure it.

It is, however, among the tens of thousands of members of our own profession that we must look for direct support. To them therefore we address this appeal, and we urge them—senior staff engineers included—to promote without delay the formation of staff councils such as we have here suggested. We hope that they will also join the ranks of their professional brethren within this Society, so that they may help us to carry to a successful issue the important work before us.

LEGAL.

British Thomson-Houston Lamp Patents.

Mr. Justice Romer, in the Chancery Division, on October 19th, granted to the British Thomson-Houston Co., Ltd., a perpetual injunction restraining B. W. T. Rennell from infringing its leading-in wire patents for incandescent electric lamps, ordered him to deliver up the infringing articles, and directed an inquiry as to damages.

He also continued an injunction granted *ex parte* a week previously against Kesler & Co., and made the usual order in favour of the plaintiff company in a motion brought by the British Thomson-Houston Co. against L. T. Don, of Great Alie Street, Whitechapel, in default of defence to an action against him for infringing its lamp patents.

Industry & Commerce Alliance, Ltd., v. Willesden Electric Co., Ltd.

In the King's Bench Division, on October 18th, before Mr. Justice Bailhache, plaintiffs, of Vernon Place, London, sued the defendants, claiming £706 19s. 6d., the price of goods sold and delivered.

Cecil Douglas Falcke, general manager to the plaintiffs, gave evidence to show that the goods had been delivered and had not been paid for. The full price was £1,011 9s. 6d., but certain credits reduced the claim to £706 odd. There was no appearance for the defendants, and his Lordship gave judgment for the plaintiffs for the amount claimed with costs.

Kerry Electric Supply Co. Fined.

At Killarney District Court, before District Justice Cahill, last week, the Killarney Urban Council summoned the Kerry Electric Supply Co. for having taken water from a pipe belonging to the Council, which had not agreed to supply the company with water. There was a second summons against the company for having fixed a water pipe without the permission of the Council. The Court held that the Electric Supply Co. had no right to do what was complained of by the Council without the Council's authority. He fined the company £2 10s., in the first case, and £1 in the second case, with full costs.

International Tramway Union.—The Executive Committee of the "Union Internationale de Tramways, de Chemins de Fer d'Intérêt Local et de Transports Publics Automobiles" has decided to accept the invitation received from the Prefect of the Seine to choose Paris as the place of meeting of the 19th International Congress, to be held in 1924. The date and programme of the meeting will be determined later.

THE INSTITUTION OF ELECTRICAL ENGINEERS.

Inaugural Address.

By Dr. Alexander Russell, President. (*Abstract.*)

Transatlantic Radio-Telephony.—During last year satisfactory progress has been made in the development of transatlantic radio-telephony. It has been proved experimentally that under favourable weather conditions telephony between New York and London is perfectly satisfactory. The results published show that there are very large daily variations in the audibility and also very large seasonal variations. The assumption that the daily variation is due to the difference in the absorbing qualities of the atmosphere in daytime and nighttime leads to results which agree well with the experiments. The latest results indicate that it will be necessary to use a wave-length greater than 5,000 metres if the best voice transmission is to be obtained.

The Electric Lighting Industry.—Since the termination of the war the section of the industry which deals with the supply of electrical energy has been very active and real progress has been made. Now that prices are falling to values approaching pre-war level, a large amount of generating machinery is being installed in all parts of the country. In the boiler house radical developments are taking place. The possibilities of pulverised fuel are being thoroughly investigated both in this country and in America. Steam pressures of 350, 450 and even 500 lb. per sq. in. are not uncommon. The new station of the Edison Electric Illuminating Co., of Boston, will have boilers supplying steam at a pressure of 1,200 lb. per sq. in. to a 2,500-kW high back-pressure turbo-generator. The exhaust steam is reheated to 700 deg. F. and then enters a second turbine which is of ordinary construction.

The English Electric Co., in association with the Benson Engineering Co., of London, is making experiments at the present time to generate steam at about 3,200 lb. pressure per sq. in. which, after being throttled to 1,500 lb. per sq. in. by means of a reducing valve and its temperature raised to about 700 deg. F., will be used to drive a specially constructed 350-kW turbine. After being expanded in this turbine the steam will be reheated and passed at a pressure of 250 lb. per sq. in. to a low-pressure turbine which will be of ordinary make. That difficulties will be encountered in the manufacture of these very-high-pressure turbines is certain. That economies would result from their use is equally certain. Increasing the steam pressure will secure a higher thermodynamic efficiency. It will also have the advantage of reducing the size of the steam pipes. The pioneers of the method are to be congratulated on their courage and their foresight.

In the turbine room the size of generating plant continues to increase. Several sets of 25,000 kW are in operation, and in a London station now being built 35,000-kW sets are being installed. Messrs. C. A. Parsons & Co., of Newcastle, are constructing a 40,000-kW set for the Commonwealth Co., of Chicago, and a 60,000-kW set is being built in America.

The use of these larger sets, with the corresponding increase in the total capacity of the modern power house, has led to great improvements in switchgear. As such switchgear under modern conditions may be called on to break over a million kilowatts and under such circumstances is subjected to enormous mechanical and electrical stresses, much still remains to be done in safeguarding it from damage. The British Electrical Research Association has the problem in hand and is carrying out a series of tests on switchgear which is likely to yield important results.

Since 1918 the thermal efficiency in large power stations has almost doubled. To-day, there are power stations in different parts of the country with a thermal efficiency of 18 per cent. An efficiency of 25 per cent. may be attained in the not very distant future.

The cable makers of this country are to be congratulated on their successful solution of the problem of making underground cables suitable for 66,000 volts. The number of overhead lines for transmission over long distances and for transmitting energy over scattered rural districts is rapidly increasing. There are, however, indications that for power transmission in country districts cheaper systems of underground cables using 11,000 and 22,000 volts respectively will become common. Where a single-phase system of supply is used these methods will compare favourably as regards cost with overhead lines.

The use of polycore cables for a working pressure of 33,000 volts is becoming general in large industrial areas and in cities. At a few stations where the loads justify it higher working pressures are used or are on the point of being used. When polyphase systems are employed there is still, unfortunately, a difference of opinion as to whether it is more advantageous to use a polycore cable or single-core cables. The leading cable manufacturers are prepared to guarantee three-core cables up to 66,000 volts, and there are already a few of these cables in use.

In the United States and Canada, where electricity is in more general use than in this country, there is a demand in the great industrial cities for cables which will withstand working pressures of at least 100,000 volts. Manufacturers are seriously considering the construction of short feeders for 100,000 volts as a commercial experiment. In a few years' time the question of using these very high pressures will have become one of great urgency in this country owing to the rapid increase in the load. Should, however, the supply engineers decide on their immediate use it will be necessary to use single-core cables.

Throughout Holland 50,000 volts has been adopted as the standard pressure for primary power transmission. Overhead transmission in conjunction with underground cables is in general use. It is interesting to notice that in several cases both three-core and single-core cables are used simultaneously. Data which will enable a practical comparison of their relative merits to be made will therefore soon be available. The three-core cables are of British and the single-core cables are of German manufacture.

Post Office Automatic Telephony.—The British Post Office, having had experience of the successful and economical working of 17 automatic exchanges in public service in this country, has decided that in future this type of equipment shall be adopted in all important areas. Arrangements have been made for the introduction of automatic switching in London.

Long-Distance Communication.—The rapid expansion of telephone traffic between Great Britain and the Continent has rendered it necessary to consider the adoption of a type of submarine cable capable of carrying a larger number of channels than those at present in use. The manufacture for the Anglo-Dutch telephone service has, therefore, been commenced of a paper-core, lead-covered and continuously loaded cable.

Developments in Radio-Telegraphy.—The main trend of recent progress in radio-telegraphy has been in the direction of improvements in methods of transmission by the elimination of harmonics and impurities, and development work in connection with high-power radio transmitters, using silica valves and water-cooled metal valves.

As the result of successful experiments on the use of a coupled circuit on an arc transmitter at the Northolt station, a similar circuit is now being installed at the Leafield station supplementary to the 250-kW arc installation. Very marked improvement has been effected in the suppression of harmonics and other undesirable emissions by the introduction of these circuits.

Valve transmitting sets producing 40 kW in the aerial have been assembled and operated, using both silica valves and water-cooled metal valves. The most powerful valve which has proved commercially satisfactory is capable of producing 14 kW of high-frequency power in an oscillatory circuit. As the result of experimental work, valve transmitters are to be used in the new high-power station now in course of erection at Rugby. This station, rated at 1,000 kW, is designed to deliver 500 kW to the aerial circuit. The height of the masts for this station is to be 820 ft. Eight are now being erected, and the site is so arranged that extensions up to twice that number can be carried out.

Railway Electrification.—Large orders for the extension of the electrification of railways in New Zealand, Australia, Brazil, and Japan have been received in this country. Electric traction engineers and manufacturers are looking forward to a busy future. With the high pressures now available for transmission and the use of automatic sub-stations there is no technical reason why the whole of our railway systems should not be electrified. One benefit will be the diminished inroads on the limited stores of coal in our mines on which posterity has some claim. Mr. Roger T. Smith has calculated that if the railways of this country were electrified there would be a saving effected of about 50 per cent. in the quantity of coal consumed.

Research.—The British Electrical and Allied Industries Research Association has broken much new ground and obtained interesting and important results. The opening of the Research Laboratories of the General Electric Co. at North Wembley is an excellent augury that the importance of scientific and commercial co-operation will soon be recognised by every leader of industry.

Our progress depends very largely on the work of the rank and file in the industry. It especially depends on those who make new inventions or perfect old methods. Some improvements may seem trifling to many and some may appear almost self-obvious. As, however, they may cheapen the cost of production and improve the quality and efficiency of our manufactures, they are of the highest value from the point of view of our national prosperity.

Thunderstorms.—A remarkable thunderstorm visited London on the night of July 9-10, 1923. The lightning flashes in some places occurred with only a few seconds' interval for hours at a time. The discharges were mainly from cloud to cloud or from a cloud to the upper air, and so the damage done was not serious.

It will be useful to consider the physics of the problem. From data published by the Meteorological Office we find that in the South-East of England if the temperature of the

air at the earth level be 10 deg. C., then as we go vertically upwards it falls uniformly for a distance of six miles, where the temperature is only about —53 deg. C. After this altitude is attained the temperature, curiously enough, remains almost constant up to the greatest height reached by pilot balloons, which is about 12 miles. The layer of the atmosphere up to six miles high is called the troposphere. Above this is the isothermal layer called the stratosphere. Clouds only appear in the troposphere. There is very little moisture in the stratosphere. For example, practically no snow falls on the top of Mount Everest. The snow on it is blown up from lower down the mountain.

On a calm day as we go upwards the electric potential gradient diminishes. In midsummer a usual ground value is of the order of 100 volts per foot. In mid-winter the average ground value is at least twice as high. In foggy weather it is sometimes greater than 500 volts per foot. In fine weather the potential difference between the ground and the top of the troposphere is of the order of a million volts, and above this the potential gradient is practically zero, and so the isothermal layer is also an equipotential layer. This voltage between the earth and the equipotential layer is, however, much too small to produce a lightning flash. That requires at least thousands of millions of volts.

The surface of the earth is generally at negative potential, but it sometimes has a small positive potential. Owing to the vertical potential gradient, the electrons from the earth are always moving skywards and act like a vertical earth air current.

At a height of three miles the temperature is below the freezing point and the electric strength of the air is only about half what it is at the surface of the earth. At a height of 24 miles the barometric pressure would only be about 2.4 mm., and the electric strength would only be of the order of some hundreds of volts per centimetre. At some height, probably about 30 miles vertically up, the electric strength would attain a minimum value. At greater heights it would begin to increase very rapidly and soon become at least 30 times greater than the electric strength of air at ground level. A good vacuum has an electric strength at least 26 times the strength of air at ordinary pressures.

Let us now consider very briefly the mechanism of a thunderstorm. Owing to the small potential differences produced by the ordinary earth-air electric current, and consequently the minute amount of electrostatic energy stored in the field, we are justified in assuming that the most important function of this current is in assisting to start the storm. A thunderstorm usually travels over considerable distances and keeps on generating prodigious quantities of electrical energy. It functions like an electrostatic machine driven by a very powerful motor. We have to consider what produces the energy which the lightning flash converts into heat, light, sound and radio waves. Aviators and balloonists report that the air in the centre of a thundercloud is practically always moving upwards with considerable velocity. In the upper layers of the troposphere, owing to ionisation, there are sometimes many free electrons. If the humidity of the upward current of air be high enough the vapour condenses round the electrons and so the air is full of minute globules of water. Some of these coalesce and form larger drops. If the vertical velocity of the air be greater than eight metres per second (17 miles per hour) the large drops as they are blown upwards often break into smaller drops. Experiment shows that the charge on the smaller drops is generally negative and that on the larger drops positive. As the larger drops are often kept oscillating in the higher and very cold strata of the atmosphere owing to fluctuations in the velocity of the air currents, they keep melting and freezing again, producing ordinary hailstones. As the gusts vary, we have the large drops and hailstones positively charged descending. Electrical energy, due partly to the work done by gravity on the descending drops and by the air currents on the ascending drops, is stored in the atmosphere. On the upper part of the cloud we have a negatively charged layer and on the lower part a positively charged layer. The falling drops keep increasing the potential difference until it gets so high that a disruptive discharge ensues.

We have imagined the cloud to be bipolar. Several kinds of electric discharge can therefore ensue. We may have brush discharges between the upper layer and the better conducting layers higher up. Some kinds of sheet lightning could be caused in this way. On a summer evening, it is not very unusual to see sheet lightning in broad flashes coming from a cloud and ending in the upper air. An ordinary flash also has sometimes been observed to end in clear air. If another cloud drifts up we may have a flash between the upper layer and this cloud. We may have flash discharges between the lower layer and the earth or another cloud. Possibly also we may have a flash-over between the two poles of the thunder cloud when they are not too far apart. C. T. R. Wilson describes this phenomenon by saying that the cloud may be short-circuited.

Operations of this nature happen during a thunderstorm. The separation of the charged drops due to the difference in their velocities produces high potential differences. There is plenty of energy available. The work done by an inch of rain falling a mile is 27,500 ft.-lb., or the one-hundredth part of a kilowatt-hour, per square foot of the earth's surface. It has recently been shown that in general the purer the rain drops the greater are the electric charges they assume on precipitation. In particular any contamination of a raindrop with sodium chloride diminishes the charges produced when it breaks in air. This possibly has the effect of diminishing the intensity of thunderstorms at seaside towns. It has been suggested that the introduction of ammonia into the upper layers of the atmosphere would hinder the development of a thunderstorm. To utilise this practically, however, could rarely be attempted as a thunderstorm usually covers a large area.

What we as engineers are specially interested in is how to protect buildings and apparatus and power and communication lines from damage due directly or indirectly to lightning flashes or to the gradual accumulation of electric charges. I think that there is no need to call a second Lightning Rod Conference. The principles laid down by Sir Oliver Lodge at this Institution in 1889 still hold good. They have been adopted by the Lightning Research Committee of the Royal Institute of British Architects. In practice they are found quite satisfactory.

We now know that a lightning discharge is unidirectional although it may be rapidly pulsatory. But even a unidirectional discharge gives rise to an alternating current in line wires, and may give rise to alternating currents in lightning conductors. The wires in insulated conductors have been found broken into small pieces by a lightning discharge. This seems to point to rapidly alternating currents. Lodge's A and B flashes of lightning are known to all students of electrical engineering. The B flash, which is the dangerous one, is also referred to as an impulsive discharge. I think that possibly too much stress is laid on the importance of having a low resistance to earth of a lightning rod. About 25 years ago I measured the resistance to earth of the conductor of a large chimney stack. It came to 70 ohms. As the end of the conductor was buried in coke I had it dug up to examine the earth plate. This was found to be a brick placed there twenty years previously by the workman who erected it. I was told that the conductor had several times been struck by lightning and acted quite satisfactorily. I have noticed that workmen before the test is made sometimes pour a pail of water on the spot where the conductor enters the ground. Possibly they think that a high earth resistance is a reflection on the way they perform their duties.

I think it highly desirable that records of curious lightning phenomena should be kept. In the eighteenth century this was done; the *Philosophical Transactions* of the Royal Society before 1800 contain very many interesting records. If we knew exactly the mechanism of thunderstorms the need for recording unusual phenomena would not be so urgent.

Many years ago, when I was on the coast of Ayrshire, on the west side of Scotland, I saw what I consider to be globular lightning. Although the visibility was very fair there was a curious haze higher up. The ground potential gradient was probably high. Suddenly two spheres of incandescent gas of a dull reddish colour about 20 or 30 ft. up moved slowly in from the sea. They were each about a foot in diameter. One of these hit the wall of a building, but did no apparent damage although it made a loud report and considerably startled the inhabitants. The other drifted away.

I consider that the evidence in favour of globular lightning is overwhelming. Witnesses testify to seeing it, to hearing it burst, to finding small metal objects melted by it, and even to seeing people killed by it.

Globular lightning seems to be a brush discharge taking place at the end of a column of air of higher conductivity than the neighbouring air. The difficulty in accepting this explanation, however, is in seeing how the conducting column can go through rooms and yet provide sufficient energy to the globe a considerable distance away to do serious damage. In certain cases, however, it may possibly get its energy from the atmosphere by another path when it bursts.

Mathematical Theorems.—In conclusion, a few mathematical theorems are given, which are discussed in the Appendix. The first theorem shows that the inductance coefficient per unit length of the current in one cylinder is not equal to the inductance coefficient of the current in a second parallel cylinder with the current in the first cylinder except in the case when the two cylinders are equal to one another. The values found for the inductance coefficients can be at once applied to find the effective inductance of a concentric main in which the inner or outer or both of the conductors are made up of individual wires.

The second theorem discussed is to find the position of the site of a power station when the feeding points are given so that the amount of copper required for the feeding mains may be a minimum for the given power loss in them. It is shown that if the current required at or near one of the feeding points is equal to or greater than the sum of the currents required at the other feeding points, then this is the site which makes the copper required for the mains a minimum. It will be noticed that this site is not the centre of gravity of the load.

The third problem discussed is that of the specification of wave shape for alternators. The deviation and harmonic factor methods are examined and found unsuitable. An easy

thod is suggested for finding graphically the effective value d the first and third harmonics of an alternating-current ve from its oscillogram. If the effective value of the wave nes out equal to the amplitude of the first harmonic within limits of the errors of observation and the ratio of the plitude of the third to the first harmonic be sufficiently all, and if, in addition, there is no obvious ripple on the ve, then it may be considered to be satisfactory.

The final problem discussed is that of specifying the power ctor of a polyphase load. In single-phase working the merical value of the load in watts, the value of the power ctor, and whether it is lagging or leading are sufficient to ecify the load. In polyphase work, however, not only have e to consider the load and the power factor, but it is necesry to introduce another factor to measure the balance or e want of balance of the currents taken from the mains. r the same total load and average power factor we can have kinds of loads more or less desirable. But if a balance ctor is given in addition, then the nature of the load is ecified much more definitely. A first attempt has been ade to specify an unbalanced polyphase load. The author pes that others will follow up and improve his suggestions.

Western Centre: Chairman's Address.

e first meeting of the 1923-24 session of the Western Centre the Institution was held at Cardiff on October 15th. The airman (Mr. F. Tremain, of Bristol) presided and there was representative gathering from the whole area covered by e centre.

Mr. Tremain, after the routine business had been concluded, troduced the chairman for the ensuing year—Mr. C. T. lan, of Cardiff—who then delivered his inaugural address on e training and, more particularly, the status of the engineer especially the electrical engineer—an abstract of which llows:—

Concerning the training of young engineers, the youths hose capabilities will in the near future determine the posi-on Great Britain is to occupy among the engineering nations f the world, I sometimes ask myself if we are not too intent pon producing craftsmen—skilled manual workers—and too ften forgetful of the demand for thinkers, men of brains ith creative ideas and higher technical knowledge. That he latter species must always be rarer than the man with ever fingers is all the more reason for seeking him out and ultivating him. The fetish of manual training is often over-one, because machine and mass-production methods may ften leave an apprentice with little knowledge beyond that f operating one or two machines. I am not decrying manual raining in reason, but some of the Continental nations do not llow an engineer to practice until he has taken his degree, nd it is from these nations that we have to expect fiercer and till fiercer competition in the coming commercial war.

Advanced training should be within the reach of all, even *free of cost* if possible, and the money spent for such a pur-ose would be returned a hundredfold—nay, a thousandfold. The trained mind alone can enter into the professions and the igher branches of business. Our own Institution's associate lembers' examination is a step in the right direction, but uch remains to be done. It has too long been an accepted elief that the technical man can have no proper grasp of usiness methods and finance. It is undeniable that "money alks," and so our young men must have sound training on he management of that eloquent commodity. None of the echnical colleges teach the art of economically spending noney, yet the engineer has been described as "a man who knows how to do a job for one pound that anyone else could ot do for two."

Why is it that the engineering institutions have had such n uphill job in establishing the status of the engineer? Why s he so little understood and appreciated? The bed-rock of the whole question is publicity. The Institution to which we have the honour to belong has laid down very proper rules as to professional conduct, and we gladly uphold those rules. Yet the present position is very unsatisfactory.

The doctor comes into frequent contact with all his patients; the actor and the artist are interviewed and news-papers make them famous; but the engineer, usually serving boards of directors and corporations without body or soul, is known only to his own staff; on the films you will see the air-man, the musician, the traveller, and the soldier, but did you ever see an *engineer* on the films? I believe that this matters very much. The age of publicity has dawned and the rewards of modern life are in proportion to merit and publicity judiciously mingled. Unfortunately publicity can do almost anything. Electrical engineers have the best commodity in the world to sell, but hitherto we have not known *how to sell* it. Sometimes the engineer affects to despise publicity, but he is *utterly* wrong, and the British engineer is wrong in particular. Not only has he personally suffered from his own isolation; the progress of engineering in general has suffered because we are uncommunicative.

In Chicago there is a demand of no less than 800 kWh per annum for every man, woman and child. The average in this country—80—is considered quite a respectable figure. Some of this astonishing contrast may be due to cheap English gas; some of it is due to the American consumer being more willing to try a new thing; but quite a lot is due to the fact that the American electricity supply interests understand publicity and that ours *do not*. The E.D.A. should be in a position to spend £10 where at present it spends only one. The British engineer is lacking in the spirit of commercial publicity from start to finish, both with regard to his inventions and himself.

The engineer undoubtedly is the head of the modern community, but although he does more for the civilised community than any man of any other profession he is isolated and unknown. The most ridiculous news is published about engineeirng work simply because lay writers have no immediate access to the engineer; even when he reads their nonsense the engineer "opens not his mouth."

For the engineer's utter lack of touch with the community for which he does so much I am not ambitious enough to propose offhand a detailed remedy, but the solution of this relatively small engineering problem will best be brought about by a change of mind. An evil clearly understood is already on the way to remedy. No good engineer approves of the idea of advertising in the ordinary way, but in the endeavour to dissociate ourselves from all suggestion of advertising is it not possible to go a little too far in the other direction? An exaggerated horror of publicity does not conduce to the best engineering work; the monopolising of all big new work by the senior members, who are often overloaded and no longer young, means that such work must be deputed to clerks and beginners. Thus the client is badly served and the reputation of the profession suffers. The lay Press finds the engineer aloof and non-communicative. I contend that instead of ignoring the lay Press the engineer should consider what advantage could be taken of the situation, not for himself personally, but for engineering in general.

Unfortunately this attitude of hostility towards the lay Press is often extended towards the technical Press, which is most anxious to fight our cause at every turn. There are so many things that might quite easily be told yet are withheld out of a spirit of distrust, or lack of sympathy, or fear of responsibility.

To sum up, the failure of the British engineer to appreciate publicity have grave disadvantages. As a result he suffers in status, in public esteem, and in remuneration; more than that, the products constructed by his genius are restricted in quantity. Not only are engineers at fault as individuals, but also when they band themselves together in technical bodies, combine to form a big trading and manufacturing concern, due to the bureaucratic spirit of its officials, such news as clients receive is obtained only from catalogues.

Such a totally wrong and unnecessary situation accounts for the fact that, although the British engineer is the best in the world, he is very far indeed from being the best appreciated; that the legislators penalise him; and that non-technical officials succeed in making him a subordinate. Add to the engineer's training the art or self-expression and nothing can prevent him from taking his place at the head of affairs.

I hope the engineer of the immediate future will see his opportunity and assume his natural right to direct as well as to construct. If he has the advantages of a trained mind as well as trained hands, sound knowledge of finance and modern business methods, and the power of self-expression reinforced with practical knowledge, he cannot fail to influence the course of events and to render invaluable service, not only to his profession, but to the country as a whole.

Discussion.

An interesting discussion followed the address.

Mr. W. A. Chamen, in proposing a vote of thanks to Mr. Allan, said that they had passed through some troublous times together, which began about 1904-5, and apparently had ended at the beginning of this year. They could note the dates and form their own conclusions. They could not but admire his courage, and he thought no one could but have the greatest admiration for every characteristic he had shown in his address.

Professor F. Bacon said that Mr. Allan had said just what he would have wished him to say. He believed that higher technical education was essential for the future of British industry. He agreed that commercial education must be combined before an engineer could succeed. But the curriculum had grown in recent years to such an extent that it was really impossible to turn out students in three years who knew as much of the underlying theory as a student of, say, 20 years ago. They knew that business men got on top of engineers, but it was news to him that the business training had been acquired in college. If that were so the college would have to supply something it had never supplied before. They would have to teach people how to make money—in theory. Business was, after all, born in one, and if in college they taught a man to think, and had imparted to him knowledge of the physical meaning of the quantities in which he dealt, they had done about as much as was possible in three years.

Mr. F. Tremain was inclinde to support the proposal of business training. In America, where the telephone had developed so much, the engineer was absolutely predominant. He thought directors and others would be very well advised to draft some promising members their engineering staff to

the sales department. If that was done they would ensure that when clients were advised as to what apparatus they should install, they would get something which would be a credit to the industry.

Mr. H. I. Rogers, of Bristol, did not think business training was all that it was made out to be. Making money was something which could only be learned by hard experience, and he did not think they could ever learn very much about it in college. As regarded practical training, he thought it a waste of time to put a young fellow for three years into works after a college training. A couple of years should be quite sufficient for an ordinary man. Practical training could be overdone.

Mr. Herbert Spence-Thomas, Cardiff, referred to the system of training in America, where the students to a great extent paid for their own education. They were enabled to work for six months of the year and study for the remainder of the period. The student was thus able to gain a commercial knowledge in conjunction with his engineering training. Such a system might prove a success in this country.

Mr. T. Hood referred to the good work done by Mr. Allan. As regarded commercial training he was in accord with Prof. Bacon. There was only one school in which a boy could acquire commercialism, and that was in the school of hard experience. A boy's training on the technical side might be adversely affected if he was over-laden with commercial instruction. Engineers, as a body, seemed loath to take part in municipal enterprise, but he felt that City engineers would be greatly helped if they had some members of their committees who were *bona-fide* engineers.

Mr. Morgan Rees, a visitor, spoke as a business man, and said he was in favour of more publicity. No matter how good an article was, if they didn't let the public know that they had it to sell they could not make progress. He thought that what applied to industries applied to the engineering profession.

Major David said that at present it was far easier to get a thoroughly good training in engineering than ever before, and the provision made for students by some of the big concerns was admirable. He did not agree that shop training was unnecessary or was not worth more than two years. He thought, as a matter of fact, that shop training should last at least four years. The training should, in his opinion, be purely in the fundamentals, and no attempt to teach business should be made. A boy had to be in a shop to learn the characteristics of the workmen. Their troubles as engineers occurred not through mistakes in the method of doing the business. The British nation was very largely composed of men whose motto was: "If thou know'st nowt, say nowt; and if thou know'st summat, say less." He thought the most drastic offender against the ethics of their profession was the man who sat by and said nothing and let people go on with their wrong methods.

Mr. J. Smurthwaite, a veteran Cardiff journalist who was invited by the chairman to give his idea, as a pressman, of the engineer, said that his experience was that it was most difficult to obtain any news from an engineer. He was generally handed over to a commercial head, who knew little of the real subject, and if an engineer did give any information it was usual to make the request: "For God's sake don't say where it came from."

Mr. W. Burr, of Swansea, thought a young engineer should have some idea of commerce before he left college, and some little special training would greatly assist him. They had an exaggerated idea of what was required on the accountancy side and in several cases the engineer had been pushed back simply because of his lack of commercial training.

Mr. Cleaver, the chief engineer at the G.W.R. Docks, Newport, said he thought there was a little too much dignity about many of their younger engineers.

Professor Knox wanted to know what was meant by the words "an engineer"? The term now was applied to a man who had control of a drilling machine equally with the man who had charge of the biggest installation in the country. He criticised the method whereby the Board of Education forced boys in technical schools to become artisans. It made the curriculum such that it was impossible for a boy ever to matriculate. In Germany, France, Belgium, and Austria, the men at the head of most of the big corporations were engineers. Why limit the college course to three years? There was no reason why they should not have a course of four or five years. In Germany the course in engineering was five years. Everybody took the same course for three, but for the last two the students were divided into classes for which they were best fitted. This was made possible by the big grants made by firms to the universities. They did not get that co-operation in this country. A student needed to know something about the economics of production, and it ought to be quite possible in every instance to teach the fundamentals. With regard to publicity, engineers were an unknown quantity. In a recent examination a student was asked to write an essay on what he knew of one of seven prominent men. Three of the names given were those of engineers, but not one student chose an engineer for his subject. Even students who had gone through a course of training were ignorant of the great men who had preceded them. He concluded: "Teach the history and the evolution of engineering."

North-Eastern Centre: Chairman's Address.

The 1923-24 session of the North-Eastern Centre of the Institution was opened on October 22nd, at Newcastle-on-Tyne, when Mr. Thomas Carter, the newly-elected chairman, delivered his inaugural address, which is abstracted below:

Mr. Carter, having thanked the members for the honour they had done him in electing him chairman, said that gathering reminded them that they belonged to a body of nearly 11,000 persons with common interests and aims, actively participating in works of national importance. In a brief historical survey of engineering, the speaker emphasised the fact that the development of engineering was really a matter of relatively few years. The twentieth century had witnessed already amazing developments—it was calculated that more fuel and iron were taken out of the earth between 1911 to 1921 than during the whole of the nineteenth century, and they were still tending to use their resources at too great a rate. The study of fuel was, however, attracting special attention, and important results were being obtained with extra-high-pressure steam plant.

Dealing with some technical principles, the speaker emphasised the necessity of a firm grasp of underlying principles in order to progress in the understanding of what was being done. Much attention had been given from time to time to output coefficients, mass factors, or size factors, as they were variously called—those being expressions that attempted to set out the relation between output and dimensions. The usual assumption for dynamos and motors was that their output depended on the volume of the rotating part; that was, its diameter squared multiplied by its length, commonly known as d^2l; and the statement was ordinarily in the form of a curve connecting d^2l with watts per revolution per minute. It had been too little emphasised, though Carus-Wilson in 1898, and others before and after, had pointed out that the expression watts per revolution per minute did not really involve the idea of speed at all. Watts were work per second measured in joules per second, and hence watts per revolution per minute were 1/60 of the joules per second divided by the revolutions per second; that was, 1/60 of the joules per revolution. But the work done per revolution by a rotating body was numerically equal to 2π times the torque exerted by it; hence the watts per revolution per minute were $2\pi/60$ times the torque of the rotor in units, corresponding to joules; that was, $2\pi/60 \times 10^7$ times the torque of the rotor in dyne centimetres. Torque had nothing to do with speed, but was merely the product of the radius of the rotor and the total tangential force exerted on the surface of the rotor by the interaction of the magnetic field of the machine and the current in the rotor conductors.

The speaker referred to the need for more knowledge of economics amongst many of them; if every man in industry really made up his mind to think of industry before himself, what a revival there would be! The importance of adequate training for engineers was emphasised, and Mr. Carter suggested that, important as was the provision of the right sort of education for those who offered themselves to be educated, it was even more vital to select for that education only those who could use it properly. Purely intellectual training ought to be shunned; it limited, bound, and confined. The pure theorist could not go out into the world of commerce and meet his fellows with any chance of success. For that reason the purely technically-trained engineer was unfitted to sell the machines he designed or built; to his theory must be added knowledge of men and of their ways, if he was not to be beaten every time by the keen man trained to deal with human beings in the very practical school of contact with them. They should realise supremely that the man who thought that his training ended with his apprenticeship, or when he had gained a university degree, was already as one dead. The only live men were those who sought to learn from every occasion something that would serve them well in future, and of those live men they would live longest who remembered that it was not so much achievement that brought happiness as the striving after it, and that "merely to pass through experiences is nothing, but to preserve a clean heart amidst all that comes is everything."

East Midlands Sub-Centre: Chairman's Address.

On October 16th the opening meeting of the 1923-24 session of the East Midland Sub-Centre of the Institution was held at Loughborough, when the chairman, Mr. E. G. Phillips, of Nottingham, addressed members on "The Pneumatic Handling of Coal and Heavy Materials."

Mr. Phillips prefaced his address with a tribute to the memory of the late Mr. J. W. Ullett, the chairman-elect for the session, whose sudden death had deprived all who knew him of a much respected friend and colleague.

Pneumatic conveying, said Mr. Phillips, could claim to be superior to mechanical conveying for several reasons, of which, perhaps, the chief was economy in labour. Others were flexibility of the plant required, the elimination of dust, with its harmful effect on employés, and the recovery of dust where it was valuable, the reduction of wear and tear, and, lastly, the ease with which such obstacles as buildings and roads could be overcome. The last point was ably illustrated

by slides, and Mr. Phillips instanced a case where coal was lifted to a height of 226 ft., and of another where coal was carried a distance of 500 ft.

The lecturer dealt exhaustively with each part of the plant, which consisted of the following :—

1. An air pump or exhauster, of either the reciprocating or rotary type, the former being the most efficient for dealing with large quantities of air, whilst the latter, which only required lubrication at the bearings, was satisfactory where a powdery substance likely to adhere to oil was being conveyed.

2. A suction nozzle, through which the material to be handled entered the stream of air. This should (for wheat, coal, ashes, &c.) be of light construction, with some means of allowing a "free air" inlet, making it impossible to choke the nozzle by burying the end.

3. A discharger, whereby the material was extracted from the conveying pipe-line without breaking the vacuum. If the working was only intermittent, *e.g.*, the removal of ashes from a boiler-house, the discharger could be eliminated, providing the ash bunker was large enough to hold the quantity of ashes to be dealt with at each operation.

4. One or more appliances for extracting the dust and filtering the air, thus preventing damage to the cylinder walls of the exhauster.

Pneumatic conveying was not only carried out by suction; pressure was frequently used, the stream of air being blown into the transport line. The suction system was preferable when conveying materials from several points to one central storage bunker or area. The pressure system was to be preferred when the material being handled had to be taken from one position to several outlying stations. The induction system, a combination of the two, was the most satisfactory. Lubricating the cylinders of the pump presented a serious difficulty, but one firm had gone far to remove the trouble by inserting pieces of solid graphite in the piston, and the use of "Aquadag" (deflocculated graphite) was proving satisfactory. With a granular material it was best to fit an air filter between the discharger and the pump.

Pipe lines should be laid with care and all horizontal and vertical lengths should be of light section, constructed of steel. Bends, at which the wear was continuous, should be avoided as far as possible and elbows should be used, for although they wore out quickly, they could be replaced fairly easily. The velocity of the air passing up the pipe should be from 5,000 to 7,000 ft. per minute, and the conveying capacity of an efficient pipe line was approximately 15 per cent. of the total capacity. It was exceedingly difficult to feed a 12-in. diameter pipe, but 10 in. was a satisfactory diameter.

CORRESPONDENCE.

Letters received by us **after 5 p.m. on Tuesday** *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

The P.M.G. and Electrical Undertakings.

I have read with great interest the article on the subject of "The Postmaster-General and Electrical Power and Lighting Undertakings."

Whilst I do not wish to discuss the merits or demerits of the subject, may I be permitted to draw your attention to a very serious error which occurs in the typical case which Mr. Bartholomew cites as an example of where disturbance has occurred?

He states that the power main carried single-phase current at *extra* high pressure, and that the cause of the second earth was due to the earthing of a series coil in a "*high* pressure" meter. Seeing that the fault affected the e.h.p. main, I presume Mr. Bartholomew means extra-high-pressure meter, a thing which does not exist in the sense in which he describes it.

In all e.h.p. metering potential and current transformers are used, and only low pressure is taken into the meter. It is also the usual practice to earth one point of the secondary side of both the current and potential transformers.

With such metering methods I fail to understand how the case described ever occurred, and I feel sure that other information must be available—or are the details which he gives second-hand?

C.G.M., A.M.I.E.E.

October 15th, 1923.

Wireless Retailers.

In view of certain misapprehensions which appear to exist in some quarters as to the objects of the Wireless Retailers' Association and its policy with regard to protection, we shall be obliged if you will give publicity to the following :—

As its title indicates, the Association consists of accredited wireless retailers, many of whom are the proprietors of important businesses, and its objects are briefly the promotion and safeguarding of the interests of retailers.

With regard to protection, the position of retailers is perfectly clear and logical. No one is more desirous of supporting home industries than the retail trader, but so long as many British manufacturers reduce trade discounts to a level at which it is impossible for retailers to obtain a reasonable return for their outlay and enterprise, so long will they feel justified in demanding that wireless apparatus shall not be singled out for treatment as a monopoly.

Wireless Retailers' Association,
CLIFFORD & CLIFFORD,
Hon. Secretaries.

London, *October 19th*, 1923.

Electric Cranes.

May I draw attention to the fact that the writer of the article entitled "Electric Cranes," in this week's issue (19th inst.), has misquoted the B.E.S.A. specification for the rating of motors?

Following the statement that motors are rated according to the temperature rise under a run at full load for a stated period, he says that "the usually expected limit of temperature rise is 90 deg. F. (50 deg. C.) above the surrounding atmosphere, in accordance with B.E.S. specification No. 168—1923."

This is incorrect, because he has given the old, and entirely unsatisfactory rating which was given under rule No. 72—1917.

The up-to-date standard which is accepted by all leading manufacturers is the B.E.S.A. specification No. 168—1923, as quoted, but with the following rule :—

40 deg. C. (72 deg. F.) temperature rise at rated load with a margin for sustained overloads of 25 per cent. for two hours, for all continuous rated machines except the smallest, and those totally enclosed.

The rating quoted in the article was quite a mistaken one, and was never put into general use by the leading motor manufacturers.

E. V. Edwards.

Bedford, *October 21st*, 1923.

Strictly Home Office?

From time to time, I have occasion to negotiate for ironclad polyphase power distribution boards for factory equipments, which should conform to the somewhat vague Home Office recommendations and requirements. Now, there are many firms with good standard products suitable for a generating station, and what I will designate the supply side only. With a few notable exceptions, few of our so-called switchgear manufactures can supply promptly a good standard ironclad distribution board product at a reasonably competitive price. Yes—they are all prepared to get out a design including my fads, at an inflated faddist's price, and at an impossible date of delivery. Where is the maker of really Home Office ironclad distribution boards, with standard replacements? Many of the goods that come before me are made up of So-and-So's elements, assembled by Messrs. —— & Co., who with all their draughtsman's experience, have, obviously, never personally erected or connected up the goods put forward as being of Home Office pattern. Generally the erector is blackmailed by, say, having to set or bend a pair of 61/.103 insulated in-coming mains at right angles, the working space being frequently limited to comfortable turning room for a mouse.

Removable fuse handles of genuine Home Office type are common. But what is exposed when the handle is withdrawn, for the purpose of renewing a fuse? I am particularly referring to boards within the range of, say, 50 to 400 amperes per way.

Again, brass contacts and clips are more generally supplied, whereas in our home atmosphere, nothing but copper or possibly phosphor bronze will stand up for more than a month or two.

All the foregoing refers particularly to low-pressure factory equipments, at 200 to 600 V.

W. E. Rogers, A.M.I.E.E.

London, *October 21st*, 1923.

Inter-Scandinavian Power Transmission.—Concerning the long-projected scheme for the transmission of electrical energy from Norway *vid* Sweden to Denmark, Mr. Borgquist, principal of the Swedish Waterfalls Administration, is reported to have recently stated that the question could be regarded as purely theoretical until further notice now that it had been declared in Danish circles that they were not thinking further of the matter for the present; nevertheless, the principal stated that there was reason to assume that the problem would again come forward, and it was therefore necessary to have the legal side of the matter made quite clear. As a consequence an examination was being made as to whether the Norwegian transmission of power through Sweden could be regulated from this point of view. It was certain that years would elapse before the project could be realised.

NEW PATENTS APPLIED FOR, 1923.

(NOT YET PUBLISHED.)

Compiled expressly for this Journal by Messrs. Sefton-Jones, O'Dell and Stephens, Patent Agents, 285, High Holborn, London, W.C. 1.

24,942. "Electrical apparatus." H. Ashton and P. Ashton. October 8th.
24,943. "Railway, tramway, and road vehicles." C. E. Holden. October 8th.
24,954. "Method of minimising dazzle of head-lights." T. P. Jones. October 8th.
24,967. "Sparking plug." A. N. Drummond. October 8th.
24,970. "Wireless detector." H. E. Herrington and W. T. Sleath. October 8th.
24,991. "Apparatus for converting sound waves into variations of electric current." T. W. Case. October 8th.
24,995. "Inductance devices." Western Electric Co., Ltd. (Western Electric Co. Inc.). October 8th.
24,996. "Speech-frequency translating systems." Western Electric Co., Ltd. (Western Electric Co. Inc.). October 8th.
24,997. "Telephone exchange systems." Western Electric Co., Ltd. (Capek and Broek). October 8th.
24,998. "Electric signalling systems." Western Electric Co., Ltd. (Western Electric Co. Inc.). October 8th.
25,014. "Electric systems for automatic sub-stations." Metropolitan-Vickers Electrical Co., Ltd. October 8th. (United States, October 6th, 1922.)
25,016. "Wireless and telephonic transmitting and receiving apparatus." E. Morchen. October 8th.
25,029. "Ventilation of electrical, &c., apparatus." Metropolitan-Vickers Electrical Co., Ltd., and J. W. Young. October 8th.
25,030. "Vacuum electric tube devices." W. J Brown, Metropolitan-Vickers Electrical Co., Ltd., and E. Y. Robinson. October 8th.
25,032. "Incandescent electric lamps." R. D. Bangay. October 8th.
25,036. "Telephones." N. Easterbrook. October 8th.
25,049. "Electric resistances." A. E. Watkins. October 8th.
25,066. "Rubber cap for telephone receivers." F. Tidy. October 9th.
25,069. "Electric heat alarms." N. Bendixen. October 9th.
25,084. "Electric switches and switch fuses." W. L. Barber and Midland Electric Manufacturing Co., Ltd. October 9th.
25,089. "Wireless telephony, &c." H. Stevens, A. J. Stevens & Co. (1914), Ltd., and H. Taylor. October 9th.
25,097. "Wireless aerials." G. V. Dowding and K. D. Rogers. October 9th.
25,101. "Automatic electric switches for motor vehicles, &c." W. H. Glaser and C. A. Vandervell & Co., Ltd. October 9th.
25,110. "Electric heating of incubators." E. G. Thompson. October 9th.
25,116. "Terminals for electric wires, &c." F. E. Hollyer. October 9th.
25,121. "Lifting magnets." F. Krupp Akt. Ges. October 9th. (Germany, October 24th, 1922.)
25,122. "Variable inductances for radio-frequency circuits." A. T. Scott. October 9th.
25,135. "Protective apparatus for alternating electric current systems." British Thomson-Houston Co., Ltd., and A. S. FitzGerald. October 9th.
25,136. "Protective apparatus for alternating electric current systems." British Thomson-Houston Co., Ltd., and A. S. FitzGerald. October 9th.
25,137. "Telephone receivers, &c." British Thomson-Houston Co., Ltd., J. H. Butcher, and A. P. Young. October 9th.
25,138. "Electric tachometers." British Thomson-Houston Co., Ltd., L. Griffiths, and A. P. Young. October 9th.
25,142. "Electric sub-stations." Metropolitan-Vickers Electrical Co., Ltd. (Westinghouse Electric & Manufacturing Co.). October 9th.
25,143. "Electric sub-stations." Metropolitan-Vickers Electrical Co., Ltd. October 9th. (United States, May 19th.)
25,148. "Delay mechanism for overload circuit-breakers, &c." A. D. Oliver and E. S. M. Prichard. October 9th.
25,155. "Rectifier installations." Akt. Ges. Brown, Boveri et Cie. October 9th. (Germany, October 9th, 1922.)
25,158. "Multi-core electric cables." P. Dunsheath and W. T. Henley's Telegraph Works Co., Ltd. October 9th.
25,164. "Terminals." R. J. M. Lowne. October 9th.
25,173. "Electrically-driven indicators, &c." C. E. Prince. October 9th.
25,175. "Anti-dazzle devices for vehicle lamps." F. W. Leake. October 9th.
25,181. "High-tension dry battery." J. G. Hossack. October 10th.
25,199. "Unit construction system for wireless reception." H. R. Tidswell. October 10th.
25,202. "Wireless receiving sets." P. J. Semon. October 10th.
25,204. "Wireless aerial." S. C. Weatherdon. October 10th.
25,206. "Crystal rectifiers." W. Bennison and T. E. de Vries. October 10th.
25,229. "Alternating-current arc welding apparatus." F. Schmidt. October 10th.
25,241. "Wireless receiving sets." L. H. Soundy and J. M. Turner. October 10th.
25,253. "Ignition device for internal-combustion engines." A. Petrella. October 10th. (Italy, October 12th, 1922.)
25,255. "Wireless valves." T. C. Black and Edison Swan Electric Co., Ltd. October 10th.
25,257. "Radio receiving and transmitting apparatus." R. E. V. Ely and G. Hilhouse. October 10th.
25,260. "Electric lamp-holders, &c." A. M. Coombs and A. F. W. Richards. October 10th.
25,264. "Equalising electrical charges in rubber-spreading machines." F. A. Hughes & Co., Ltd. October 10th. (Germany, January 13th.)
25,269. "Loud-speaking telephones." British Thomson-Houston Co., Ltd., J. H. Butcher, and A. P. Young. October 10th.
25,279. "Apparatus for electrolysis of water." L. Casale. October 10th.
25,286. "Electric vehicles." Tilling-Stevens Motors, Ltd., and H. K. Whitehorn. October 10th.
25,298. "Method of supporting casings, &c., for electric light, &c., wires." J. F. Oultram. October 10th.
25,300. "Electric switches." T. L. Jones. October 10th.
25,310. "Wireless receiving apparatus." J. H. McGee and E. Mackey. October 11th.
25,332. "Filter for electric welding screens." H. Schofield. October 11th.
25,341. "Means for operating electric switch for closing or opening a door." A. B. Taylor. October 11th.
25,344. "Variometers for wireless signalling." S. M. Rowlands and H. C. Woodhall. October 11th.
25,357. "Multi-speed induction motors." L. J. Hunt. October 11th.
25,367. "Variable condenser." A. Courtecuisse. October 11th.
25,371. "Magnetic alloys, and their use in telegraph, &c., cables." H. J. Garnett and W. S. Smith. October 11th.
25,372. "Electrostatic shielding material." Marconi's Wireless Telegraph Co., Ltd. October 11th. (United States, November 3rd, 1922.)
25,373. "Electric switchgear." D. R. Davies, E. M. Johnson, and Metropolitan-Vickers Electrical Co., Ltd. October 11th.
25,379. "Sound transmitting or emitting instruments." British Thomson-Houston Co., Ltd., J. H. Butcher, and A. P. Young. October 11th.
25,392. "Mounting panels for wireless, &c., instruments." J. F. Jackson. October 12th.
25,409. "Wireless receiving apparatus." E. O. Brown. October 12th.
25,430. "Electric or gas lamp shades." E. Burgess and H. G. Smith. October 12th.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1920.

33,290. "Machinable non-magnetic high-resistance cast-iron alloy." S. E. Dawson and Ferranti, Ltd. November 29th, 1920. (204,598.)

1922.

11,422. "Means for, and methods of, neutralising capacity currents on polyphase electric transmission systems." A. M. Taylor. April 24th, 1922. (204,352.)
12,317. "Electric meters." G. Sperti. May 2nd, 1922. (204,354.)
14,354. "Electric switches." W. Preston and W. Walker. May 22nd, 1922. (204,357.)
14,774. "Process of, and apparatus for electrically separating suspended particles from electrically non-conducting, especially gaseous, fluids." Lodge-Cottrell, Ltd. (E. Möller). May 25th, 1922. (204,361.)
17,438. "Inductance coils." Igranic Electric Co., Ltd., A. H. Mackley, W. S. Pyrah, and A. H. Curtis. June 24th, 1922. (Cognate application 35,298/22.) (204,376.)
17,565. "Wireless signalling systems." E. H. Armstrong. June 27th, 1922. (182,135.)
17,647. "Trolley for electric tramways of the overhead-conductor system." W. Lawrance. June 27th, 1922. (204,383.)
17,693. "Means for indicating angular position particularly applicable to wireless direction-finding apparatus." J. A. Slee. June 27th, 1922. (204,386.)
17,822. "Telegraphic receiving apparatus for producing punched tape." F. G. Creed and Creed & Co., Ltd. June 28th, 1922. (204,398.)
17,924. "Electric signalling or indicating lamps." W. R. Bullimore. June 29th, 1922. (204,401.)
17,948. "Miners' lamps and the like." W. Morgan. June 29th, 1922. (204,404.)
18,374. "Reflectors, shades, and globes for electric and other lamps." S. J. Frost. July 4th, 1922. (204,418.)
18,723. "Dynamo-electric machines." G. A. Juhlin and Metropolitan-Vickers Electrical Co., Ltd. July 7th, 1922. (Cognate application 31,694/22.) (204,433.)
18,738. "Electric resistance switches." Ward Leonard Electric Co. and L. Kebler. July 7th, 1922. (204,434.)
18,878. "Advertising signs or the like." A. E. Ryeland and Multi-Way Earthing Clip, Ltd. July 10th, 1922. (204,437.)
18,888. "Recording instruments." British Thomson-Houston Co., Ltd. (General Electric Co.). July 10th, 1922. (204,438.)
19,059. "Arc lamps." P. Eide. July 11th, 1922. (204,441.)
21,565. "Fibre-covered cores and means and method of manufacturing same." Western Electric Co., Ltd. (Western Electric Co., Inc.). August 9th, 1922. (204,463.)
21,827. "Incandescent filament electric lamp bulbs and lampholders therefor." H. Workman. August 10th, 1922. (204,464.)
21,910. "Electric motor-control systems." R. H. Barbour and J. R. Walton. August 11th, 1922. (204,466.)
22,321. "Control systems for electric arc welding apparatus." British Thomson-Houston Co., Ltd. (General Electric Co.). August 16th, 1922. (204,473.)
22,335. "High-tension electric transformers." Veifa-Werke Akt. Ges. and F. Dessauer. August 16th, 1922. (Patent of addition not granted.) (204,474.)
22,598. "Combination bonnet lock and ignition cut-off device for motor vehicles." C. L. Cummings. August 17th, 1922. (204,476.)
22,430. "Electric lighting and similar installations on railway and other vehicles." J. Stone & Co., Ltd., and A. H. Darker. August 17th, 1922. (204,477.)
22,773. "Methods of reception in high-frequency signalling systems." E. Y. Robinson. August 22nd, 1922. (204,482.)
23,575. "Electrical coils and methods of manufacturing the same." British Thomson-Houston Co., Ltd. (General Electric Co.). August 30th, 1922. (204,491.)
23,986. "Wire-fabric reinforcements for the concrete foundations of roadways, tramways, and the like." British Reinforced Concrete Engineering Co., Ltd., and E. B. Hall. September 5th, 1922. (204,497.)
24,017. "Device for showing the temperature conditions of electric machines." E. Shroder. September 5th, 1922. (204,499.)
24,220. "Turbines for utilising tides or currents for producing electricity and for other purposes." T. M. Adair. September 7th, 1922. (204,505.)
26,596. "Rotor winding for synchronous motors without starters." C. Schenfer. October 2nd, 1922. (204,532.)
27,072. "Device for the attachment of suspended insulator chains." A. Renaudin. October 8th, 1921. (186,934.)
27,895. "Electric apparatus for the production of peroxides of nitrogen." F. Stacey. October 14th, 1922. (204,543.)
28,014. "Radio-telephonic receivers." A. E. Alexander (C. Cory & Son, Inc.). October 16th, 1922. (204,546.)
28,974. "Electric speed governors." W. Dornig. October 24th, 1922. (204,558.)
29,064. "Process of, and apparatus for obtaining large and uniform crystals from solutions." E. Passburg and H. Griffiths. October 25th, 1922. (204,559.)
30,156. "Dynamo-electric machines." British Thomson-Houston Co., Ltd., and F. P. Whitaker. November 3rd, 1922. (204,566.)
32,627. "Electric switches." British Thomson-Houston Co., Ltd. (General Electric Co.). November 29th, 1922. (204,592.)
35,035. "Control of dynamo-electric machines." British Thomson-Houston Co., Ltd. (General Electric Co.). December 23rd, 1922. (204,611.)
35,464. "Electric fuse holders." Brolt, Ltd., and W. Holt. December 30th, 1922. (204,614.)

1923.

533. "Electric cables." F. Fernie. January 6th, 1923. (204,619.)
1,458. "Systems of control of electric circuits." British Thomson-Houston Co., Ltd. (General Electric Co.). January 16th, 1923. (204,624.)
1,530. "Trolley heads for use in electric traction systems." E. E. Mathers. November 9th, 1922. (Divided application on 192,986.) (204,625.)
1,671. "Electric battery lamps." H. E. Tvermoes. January 18th, 1923. (204,626.)
2,919. "Systems of electric motor control." British Thomson-Houston Co., Ltd. (General Electric Co.). January 31st, 1923. (204,633.)
3,516. "Suspension of electrical lines, especially three-phase lines." G. Kjaer. February 11th, 1922. (193,040.)
3,945. "Insulators." British Thomson-Houston Co., Ltd. (International General Electric Co.). February 9th, 1923. (204,638.)
4,105. "Manufacture of electric lamps." Just-Fele Izzolampa Es Villamossagi Gyar Resvenytarsasag Dr. February 27th, 1922. (193,833.)
5,281. "Branch or distributing device for taking electric current from lighting wires." E. Miksch. June 12th, 1922. (198,990.)
5,358. "Electric protective systems." Electrical Improvements, Ltd., and J. R. Beard. February 23rd, 1923. (204,647.)
14,244. "Radio broadcasting equipment." Western Electric Co., Ltd. June 9th, 1922. (199,016.)
16,575. "Crystal receiver set for wireless signalling." L. L. R. Dunn. June 26th, 1923. (204,663.)
21,969. "Electric switches." W. Preston and W. Walker. May 2nd, 1922. (Divided application on 204,357.) (204,667.)